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LIST OF PAPERS

BLAISDELL (FRANK E., SR.)

Studies in the Melyridae, Number Ten. (Coleoptera). Pl. XXIX 325
(Issued January 29, 1932)

BROMLEY (S. W.)

New Neotropical Andrenosoma (Diptera: Asilidae)... 129
(Issued March 11, 1931)

CADBURY (JOHN W.)

A New Form of Sphinx Gordius (Cramer) (Lepidoptera: Sphingidae). Pl. XXVIII 319
(Issued September 14, 1931)

CALVERT (PHILIP P.)

The Generic Characters and the Species of Palaemnema (Odonata: Agrionidae). Pl. I–XXI, textfigure 1
(Issued March 11, 1931)

FALL (H. C.)

The North American Species of Hymenorus (Coleoptera: Alleculidae) 161
(Issued June 8, 1931)

HEBARD (MORGAN)

Studies in Lower Californian Orthoptera. Pl. XXII.. 113
(Issued March 11, 1931)

The Mogoplistinae of the United States (Orthoptera: Gryllidae). Pl. XXIII–XXIV 135
(Issued May 4, 1931)

LEONARD (MORTIMER D.)

Some Notes on my Revision of the Rhagionidae (Diptera) 321
(Issued December 9, 1931)

REHN (JAMES A. G.)

On the Blattid Genera Abrodiaeta Brunner (= Allacta Saussure and Zehntner) and Margattea Shelford (Orthoptera). Textfigure 297
(Issued July 17, 1931)

SILVESTRI (F.)
Notes on Grylloblatta Campodeiformis and a Description of a New Variety (Grylloblattidae). Pl. XXVI, textfigure 291
(Issued June 12, 1931)

WILLIAMS (ROSWELL C.)
Two new Hesperids from Ecuador (Lepidoptera). Col. Pl. XXV, textfigure 288
(Issued June 10, 1931)

Cuban Hesperiidae (Lepidoptera). Col. Pl. XXVII, textfigures 305
(Issued August 3, 1931)

WILLIAMS (R. C.) AND BELL (E. L.)
Hesperiidae of the Forbes Expedition to Dutch and British Guiana (Lepidoptera). Col. Pl. XXV, textfigures 249
(Issued June 10, 1931)

Index 333
List of Members v

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TRANSACTIONS

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AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LVII

THE GENERIC CHARACTERS AND THE SPECIES OF PALAEMNEMA (ODONATA: AGRIONIDAE)

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(Plates I–XXI and Text-figures 1 and 2)

Contents

PAGE

Introduction and Acknowledgments 2
Historical Summary 2
Type Specimens of the Species 4
Variations in Family or Subfamily Characters found in Palaemnema 6
The Generic Characters of Palaemnema 9
  Head 9
  Legs 10
  Wings 10
  Abdomen 12
  Color 12
Discussion of certain Generic Characters 13
  Lower sector of triangle 13
  Supplemental basal postcostal cross veins 14
  Penis 15
  Abdominal appendages (male) 17
Front and Hind Wings Compared 17
Geographical and Topographical Distribution 18
Seasonal Distribution 20
Classification of the Species 22
Key to the Species of Palaemnema 24
Descriptions of the Species 32
Explanation of the Plates 104

Introduction and Acknowledgements

The exact identification of the species of *Palaemnema* has been a matter of much difficulty, owing to the small amount of material which was accessible to previous writers and the consequent uncertainty as to the validity of supposedly specific characters. Thus, de Selys, who founded the genus in 1860, had but three specimens, when he revised it in 1886, fourteen specimens; the present author had fourteen when writing for the "Biologia Centrali-Americana" in 1903; Williamson had thirty-one (from Guatemala) in 1915 and Ris fifteen in 1918. For the present study four hundred and forty-three (364 males, 79 females) have been available from the writer's own collections and those lent by Mr. E. B. Williamson, Dr. F. M. Gaige (from the Museum of Zoology, University of Michigan), Dr. Hugo Kahl (from the Carnegie Museum, Pittsburgh), and the Rev. P. L. Navás, of Zaragoza, Spain, as acknowledged under various species in the following pages. Very important assistance has been afforded by M. G. Severin and Dr. Antoine Ball, past and present curators of insects in the Musée Royale d'Histoire Naturelle at Brussels in giving opportunity to study specimens and manuscripts in the de Selys collection, and by Dr. F. Ris of Rheinau with respect to his own collection. To all of these, to Mr. Nathan Banks, Curator of insects in the Museum of Comparative Zoology at Cambridge, Massachusetts, Mr. Samuel Henshaw, former Director thereof, and to the late Mr. Herbert Campion I would extend my hearty thanks for their kind help.

Historical Summary

The genus *Palaemnema* was established in 1860[1] by Edmond de Selys-Longchamps for three species, *paulina* Drury, from Honduras and Mexico, *angelina* de Selys, from Guatemala, and *melanostigma* Hagen, from Puerto Cabello [Venezuela], the latter two described for the first time. Brauer included the genus in his dichotomic key to the "Gattungen der Agrioninen" in 1868.[2]

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[1] Bull. Acad. roy. Belg., (2), x, p. 434. Dr. Ris has told me, on the occasion of my recent visit (August, 1929), that from hints which Baron de Selys dropped he had received the impression that the Baron intended the generic name *Philogenia* to allude to his own love for his living family, *Palaemnema* to his pious memory of his forebears.

[2] Verhd. zool. bot. Ges. Wien, Jahrg. 1868, p. 386.

In 1886, in his *Revision du Synopsis des Agrionines*,[3] de Selys added *desiderata*, from Mexico, as a race of *paulina*, *nathalia* from Panama, and *clementia* from St. Esteban, Venezuela, and gave a key to the related genera. Kirby first designated a genotype (*paulina* Drury) and catalogued the above-mentioned six species.[4] Calvert added a species (*domina*) to the Mexican fauna and, in a key to the allied Central American genera, introduced some characters not employed by his predecessors, besides giving figures of the male appendages of four of the species, and of the venation for the first time.[5] Needham gave the first direct photographic figure of the venation in 1903.[6] Williamson incidentally discussed[7] certain characteristic features of the venation and, later, by a careful detailed description of material from Guatemala,[8] showed that the brown at the apex of the wings of the male, in at least one species, is ontogenetic and therefore not necessarily a specific character, as assumed by de Selys and by Calvert, and that no noteworthy variation occurred in the appendages of 27 males of the same species, all from one locality.

Schmidt (1915[9]) and Kennedy (1917,[10] 1920[11]) discussed and figured the penes of *Palaemnema* and of other genera of the Legion Protoneura of Selys. Ris in 1918 described three new species (*peruviana* from Peru, *melanota* from Costa Rica, *carmelita* from Colombia) and additional material from Mexico and Central America under the specific names employed by Calvert, figured male appendages and gave a key to the males of seven forms or species, based on color of thorax and abdomen.[12] Munz, in a

[3] Mem. Couron. Acad. roy. Belg., Classe Sci., Tome XXXVIII, pp. 146–148.
[4] Cat. Odon., p. 132, (1890).
[5] Biol. Centr.-Amer., Neur., pp. 132–137, pls. 5, 6, (1903); p. 392, (1907).
[6] Proc. U. S. N. M., XXVI, pl. 53, fig. 2.
[7] Ent. News, XXIV, pp. 258–261, (1913).
[8] Proc. U. S. N. M., XLVIII, pp. 608–613, pl. 40, (1915).
[9] Zool. Jahrb., Abt. Anat. Ont. Tiere, XXXIX, Heft 1, p. 149, taf. 10, fig. 39.
[10] Ent. News, XXVIII, pp. 290–293, pl. 21, figs. 1–4.
[11] Ohio Jl. Science, XXI, no. 1, pp. 24–25.
[12] Archiv. f. Naturgesch., 82-Jahrgang, Abt. A, 9. Heft, pp. 91–101, figs. 48–54.

new series of keys to the Zygoptera, based on venation exclusively, included *Palaemnema* and allied genera.[13] Navás, in 1924, described *P. apicalis* from Colombia.[14]

Type Specimens of the Species

Of the species originally included by de Selys in *Palaemnema*, the first to be described was *Libellula paulina* of Drury in 1773.[14a] It is stated to have been received "from the Bay of Honduras." As will be shown more fully below, it is no easy matter to decide just what Drury's *paulina* really was. Years ago, I asked the late Mr. Herbert Campion, of the British Museum of Natural History, whether anything could be learned of Drury's type specimen. He replied, under date of 6th March, 1922: "I am sorry to say that there is no trace here whatever of the type of *Palaemnema paulina* Drury, and I do not know where to make enquiries for it elsewhere. I believe we have one or two of Drury's beetles in this Museum, but I am afraid that his collection has become so effectually dispersed that it is impossible to discover the location of any particular specimen, except by accident. I am not aware that anything helpful has ever been published on the subject." Again, on 21st August, 1922, he wrote: "Since writing to you on 6th March, I have made further attempts in likely quarters to trace Drury's type of *Palaemnema paulina*, but without success, and I fear that I have now exhausted all my possible sources of information."[15]

The next species to receive a name was *Palaemnema angelina* Selys in 1860.[16] It was described from a male from Guatemala belonging to the Museum of Paris. In response to an inquiry concerning this type, M. Lucien Berland wrote from the Museum

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[13] Memoirs, Amer. Ent. Soc., no. 3, p. 64, pl. 19, fig. 136, etc., (1919).

[14] Memor. Acad. Cien. Artes Barcelona, (3), XVIII, no. 13, p. 326, fig. 8, (1924). The name of this species had previously appeared in a local list of captures: Boletin Soc. Colomb. Cien. Nat., Bogota, XI, num. 73, p. 361, (1923).

[14a] Illustrations of Nat. Hist., II, p. 85, pl. 46, fig. 4; generic and specific names on second page of index at the end of the volume.

[15] Westwood, when he published a new edition of Drury in 1837, was equally at a loss, for he says, in his preface, that the chief difficulty in the way of his "giving the work that perfect style which I could have wished it to possess" was "the non-possession of the specimens which served for the original illustrations." This was only thirty-two years after the public sale of Drury's collection. Further confirmation of the lack of information as to the fate of Drury's insects is furnished by an editorial note in "The Entomologist," London, LVII, p. 132, June, 1924, and no additional references to the subject are given in the indexes of the following volumes of "The Entomologist" up to 1929 inclusive.

[16] Bull. Acad. roy. Belg., (2), X, p. 435; *cf.* Mem. Couron. Acad. roy. Belg., Classe Sci., XXXVIII, p. 147, (1886).

National d'Histoire Naturelle, 10 Mars, 1922: "Malheureusement, toutes mes recherches ont été vaines et je n'ai pu retrouver le type de Selys Longchamps. En l'absence de toute personne connaissant les Odonates on n'a pu trouver ici aucun renseignement sur ce sujet."

The third species of *Palaemnema*, *melanostigma* Hagen, was likewise described in 1860, on the page following the description of *P. angelina*. The type is preserved in the Hagen collection, Museum of Comparative Zoology, Cambridge, Massachusetts.

All the three forms added by de Selys in 1886 were from his own collection. *P. desiderata* and probably *P. clementia* were each represented by a single male, *P. nathalia* by at least six males and four females. The types of *desiderata* and of *clementia*, one male (cotype or paratype) of *nathalia* and a male from Honduras, which de Selys referred to *angelina* in 1886, were lent to Herr F. Foerster, of Bretten, Baden, in November, 1905, according to documents preserved in the Brussels Museum. Herr Foerster had undertaken to prepare Fascicule XXVI, on the Legion Protonevra, for the "Catalogue Systematique & Descriptif des Collections Zoologiques du Baron Edm. de Selys Longchamps." Foerster died December 2, 1918, without having furnished the promised manuscript, and his collection of Odonata was subjected to various vicissitudes before it was acquired by the University of Michigan and lodged in its Museum of Zoology. The specimens of *Palaemnema*, and some of other genera also lent to Foerster, are not at Brussels nor can they be found at Ann Arbor. It has, consequently, been no more possible for me to study the types of *desiderata* and *clementia* than those of *paulina* Drury or of *angelina*. Fortunately, a partial compensation for their loss exists in colored drawings made from the actual specimens by de Selys himself. These drawings form part of a large series representing many, if not all, of the Agrionines (*sensu Selysii*) known to him, and are now in the entomological section of the Museum at Brussels, where I saw a considerable number of them in July, 1929. In the case of *Palaemnema*, these drawings are on sheets of white paper, 17 x 21.5 cm., one sheet to a species. The (two) sheets relating to two species are mounted side by side on a stiff card 36 x 27.5 cm. The colored drawings for each species usually include a

dorsal and an anterior view of the head, a dorsal view of the prothorax, a left lateral view of meso- and metathorax with the complete hind leg, a dorsal and a left profile view of the abdomen, and either a complete wing, not specified as to whether it is front or hind, or a part of a wing, with the venation in more or less complete detail. The drawings of the six species represented (*paulina* Selys, *angelina*, *desiderata*, *nathalia*, *clementia*, *melanostigma*) are evidently all on the same scale, which is expressly stated on the sheet for *paulina* as "3 fois" and on that for *melanostigma* as "3 fois d'après nature." There are also two sheets, of the same size, of the venation only, the veins labeled with abbreviations (*e. g.*, *n. med.*, *s. p.*, etc.). The drawings of *Palaemnema* are dated in de Selys' own handwriting as having been made between October 6, 1884, and January 14, 1885. The sheet for *clementia* contains also a similar set of colored drawings for " ♀ ? Bogota (à publier) coll. R. Martin Liège 24 Mars 1893," indicating that de Selys continued to make these drawings for years after the publication of the "Revision du Synopsis" of 1886. These drawings have been cited in the following account under the respective species. M. Severin writes (21 Mai, 1930): "Selys faisait ces dessins autant que possible de suite sur les specimens qu'il reçevait et qui souvent avaient encore leurs vraies couleurs."

In August, 1929, thanks to the kindness of Dr. Ris, I enjoyed the great privilege of studying at Rheinau the types of the new species described by him (*peruviana*, *melanota*, *carmelita*), as well as other material of this genus. Finally, Padre Navás has generously sent me his type of *apicalis* that I might study it at first hand for the present paper.

Variations in Family (or Subfamily) Characters Found in Palaemnema

De Selys in 1860[17] assigned the following characters to the "Sous famille Agrionines" (Coenagrioninae or Coenagrionidae of Kirby or of some recent authors): (1) Always only two antecubital nervules; (2) wings very petiolate; (3) quadrilateral always of a single cell; (4) wings elevated in repose, except in the true *Lestes;* (5) median and subnodal sectors arising from the principal almost under the nodus; (6) the nodal much more

[17] Bull. Acad. roy. Belg., (2), x, p. 11 and footnote.

remote than the nodus, exceptions only in the true *Lestes*, etc. In his *Revision* of 1886[18] he formally employed only the first three of these, placing them in a different order, viz., (1), (3), (2). Even a very recent statement[19] of the characters of this taxonomic group is but slightly different.

It was well-known even to de Selys in 1886[18] that some genera of his Agrionines departed from his statement of the subfamily characters. Campion discussed one of these departures—from the usual *two* antecubitals (antenodals)—in 1913.[20] We give here statistics showing the *occasional occurrence of three antenodals in Palaemnema:*

Position of the Additional Antenodal

	Front Wings	Hind Wings
a. Proximal to the first normal antenodal (Pl. I, figs. 3–6, 30)..	11♂, 1♀, 1.49%	9♂, 2♀, 1.36%
b. Between the first and second normal antenodals but nearer to the first.....	1♂, 0♀, .12%	4♂, 0♀, .5 %
c. Midway between first and second normal antenodals (Pl. I, figs. 7–9).....	3♂, 0♀, .37%	5♂, 0♀, .62%
d. Between first and second normal antenodals but nearer to the second (Pl. I, fig. 10).....	3♂, 1♀, .5 %	3♂, 1♀, .5 %
e. Distal to the second normal antenodal (and to the arculus).....	0	1♂, 1♀, .25%
Total numbers of wings.....	18♂, 2♀, 2.48%	22♂, 4♀, 3.23%

Extent of the Additional Antenodal

	Front Wings	Hind Wings
In the costal area only.....	12♂, 0♀, 1.49%	10♂, 2♀, 1.49%
In the subcostal area only.....	4♂, 0♀, .50%	4♂, 0♀, .50%
In both costal and subcostal areas..	2♂, 2♀, .50%	8♂, 2♀, 1.24%
Total numbers of wings.....	18♂, 2♀, 2.49%	22♂, 4♀, 3.23%

Total number of specimens of *Palaemnema* examined for this feature: 340♂, 64♀ = 680♂, 128♀ front wings and the same

[18] Mem. Couron. Acad. roy. Belg., Classe Sci., XXXVIII, p. 1.

[19] Fraser, F. C. Journ. Bombay Nat. Hist. Soc., XXXIII, no. 4, p. 834, (Oct. 15, 1929).

[20] "The Antenodal Reticulation of the Wings of Agrionine Dragonflies." Proc. Acad. Nat. Sci. Phila., 1913, pp. 220–224.

number of hind wings, of representatives of at least nineteen species from Mexico to Peru. Seven species were represented by the individuals having three antenodals.

In only one individual, a female (*bb*) of *P. paulirica* from Guapiles, Costa Rica, do all four wings possess three antenodals, and even in it the position of this additional cross-vein is not the same in all four wings; in the right front wing the extra vein falls under *d*, in the other three wings under *a*, of the above list. No individuals were observed to possess three antenodals in three of their wings, but nine individuals were found to have them in two of their wings, either symmetrically on the front (1♂ *angelina*) or hind (1♂ *paulirica*) wings, or asymmetrically: unilaterally (1♂ *paulirica*, 1♂ *paulitaba*) or diagonally (2♂ *paulirica*, 1♂ *nathalia*, 2♂ *brucei*).

The only instance of marked variation in the *quadrilateral* ("discoidal cell") which has been noted in the *Palaemnemae* studied has been in the *presence of a cross-vein in this cell*, dividing it into two cells. Of three hundred and fifteen males, sixty-three females (630♂, 126♀ front wings and the same number of hind) examined for this peculiarity, only four male front wings (.528%), three male and one female hind wings (.528%) have been found to possess such a cross-vein. These instances were limited to two species, *reventazoni* and *mutans*, and occurred in but one wing of each individual concerned. (Pl. I, fig. 11.)

As is well-known, de Selys in 1860 divided his Agrionines into six legions and placed *Palaemnema* in the legion Protonevra, whose distinctive character was that the inferior sector of the triangle * is absent or rudimentary, not extending beyond the level of the apex of the quadrilateral. In 1917 Laidlaw[21] broke the Selysian legion into two "legions," Platysticta nov. (including *Palaemnema*) and Protoneura Selys (restricted), the first distinguished by falcate wings with trapezoidal stigma and a supplementary basal postcostal nerve, the latter by non-falcate wings, rhomboidal stigma and no supplementary basal postcostal nerve. Kennedy[22] regarded these two legions as subfamilies, Platystictinae and Protoneurinae, and Laidlaw[23] has adopted the sub-

* For the reason given in our companion study on *Philogenia* (these Transactions, L, p. 6, 1924), the old Selysian vein nomenclature has been used here also.

[21] Records Ind. Mus., XIII, pp. 339 and 343.

[22] Ohio Journ. Sci., XXI, pp. 21, 24, 27, (1920).

[23] Spolia Zeylanica, XII, p. 360, (1924).

family term. To avoid repetition, instances of variations from these subfamily characters will be dealt with in connection with variations in generic characters.

The Generic Characters of Palaemnema

The following generic characters of *Palaemnema* are arranged in order from least to greatest variability in the specimens examined, as far as convenient. These specimens consist of one hundred and forty-two males, fifty-eight females, or two hundred in all, for the labium, legs, wings (and abdomen of the female) representing the following twenty-three species (except where otherwise stated): *paulirica* 20, 5; *distadens* 16, 13; *paulicoba* 1, 0; *paulitoyaca* 5, 3; *desiderata* 1, 0; *paulicaxa* 1, 0; *paulitaba* 1, 0; *angelina* 2, 0; *domina* 1, 1; *mutans* 15, 10; *melanostigma* 3, 1; *gigantula* 3, 1; *brucei* 23, 2; *azapizui* 1, 0; *apicalis* 1, 0; *carmelita* 2, 0; *reventazoni* 4, 0; *nathalia* 25, 7; *clementia* 13, 12; *croceicauda* 1, 2; *edmondi* 1, 0; *chiriquita* 2, 0; *melanota* 0, 1. The first number after each specific name is that of the males examined, the second number that of the females. The numbers examined for the head are fewer (76♂, 43♀), but represent 21 species. The number in parentheses after each character indicates the percentage of the specimens examined in which that character exists as stated.

Head

Occiput with a transverse posterior carina (100) of about the same length as the distance between the two antennae. (First described by Williamson 1915.) (Pl. II, figs. 37 *po*, 40.)

Rear of the head (postgenae) with a parorbital carina (100), parallel to the posterior margin of each eye, from which it is distant about .1 mm. for most of its length, but diverging therefrom at its superior end. (Pl. II, fig. 37 *pr*.)

Nasus (post clypeus), in lateral view, forming an angle of more than 90° with the rhinarium (anteclypeus) (100), its lower margin with a row of 6 to 11 (95.8) rather widely spaced, relatively large, pale setae. (Pl. III, fig. 43.)

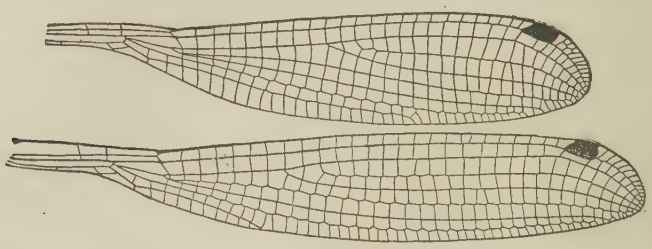
Labrum, in lateral view, forming an angle of much more than 90°, in some nearly 180°, with the rhinarium (100), more prominent than the clypeus, its setae more numerous, much more closely set and in more than one row, and usually shorter. (Pl. III, fig. 43.)

Mid-labial lobe bifid in its apical fifth or less (Pl. II, fig. 36), the divisions hardly as long as the width of the cleft separating them (99.9), except in *P. carmelita* (.1%).

Legs

Setae of the proximal half of the second and third tibiae at least twice as long as the intervals separating them (100) and usually longer.

Tarsal nails toothed (100), except where the tarsus has regenerated after injury.



Text-figures 1 and 2 (from Munz 1919). Fig. 1 (above), *Palaemnema* ♂, front wing. Fig. 2 (below), *Platysticta maculata* Selys ♀, front wing.

Wings

Quadrilateral trapezoidal, anterior side always much longer than half the length of the posterior side (100).

One supplemental basal postcostal cross-vein always present (100), a second (additional) supplemental basal postcostal cross-vein present in 2.43% of the front wings and 5.27% of the hind wings, as discussed below.

Inferior sector of the triangle present (98.02 front wings, 99.47 hind wings), totally absent in the remainder; when present, arising at the basal postcostal cross-vein (99.2 f.w., 100 h.w.); ending on the posterior side of the quadrilateral at one-third or less of the length of that side (98.02 f.w., 98.03 h.w.).

Pterostigma trapezoidal, proximal side more oblique than the distal, posterior side the longest; with a weak brace vein (97.25 f.w., 98 h.w.—shifted, usually distad, in 3% f.w., 2.5% h.w., Pl. I, figs. 23–25); surmounting 1–5 cells, varying according to the species.[24]

Arculus distinctly beyond the second antenodal by as much as the upper division of the arculus (96 f.w., 86.75 h.w.).

Ultra-quadrilateral antenodal cells two (85 f.w., 64 h.w.), less than two (10 f.w., 33 h.w.) or more than two (5 f.w., 2.5 h.w.).

[24] In the specific descriptions which follow "less than two cells" surmounted means less than two but more than one and one-half, "more than two cells" means more than two but not more than two and one-half. See under *P. nathalia, posted*, for a discussion of the stigma and its surmounted cells in that species.

Normal postcostal cross-vein ($Cu-a$) situated between the levels of the 1st and 2nd antenodal cross-veins, much nearer to the level of the 2nd (76 f.w., 81.5 h.w.) or at the level of (under) the 2nd (23 f.w., 18.25 h.w.).

Postnodal cross-veins ranging from 12 to 29 (f.w.), 12 to 26 (h.w.), according to the species.

Nodal sector (M_2 of Comstock and Needham 1899, R_3 of Tillyard 1926[25]) arising on the front wings from the 6th to the 11th postnodal, on the hind from the 5th to the 9th postnodal, according to the species.

Ultra-nodal sector (M_{1a} Comstock and Needham, IR_2 Tillyard 1926) beginning on the front wings at the 7th to the 12th postnodal, or at from 5 to 16 cells in the area behind the median vein of de Selys (R_1 of C. and N., and of Tillyard 1926), proximad to the stigma; on the hind wings at the 6th to the 11th postnodal, or at from 5 to 16 cells in the same area proximad to the stigma, according to the species.

Upper sector of the triangle of de Selys (Cu_1 of C. and N., Cu_2 of Tillyard 1926) ending at from a few cells proximad to some cells distad of the level of origin of the ultra-nodal sector, according to the species, but always distad of the mid-length of the wing.[26]

In his original characterization of *Palaemnema* in 1860, de Selys stated that the cells of the apices of the wings are quite dense, higher than wide. While this is often the case, many

[25] Insects of Australia and New Zealand, Sydney, Angus and Robertson Ltd., p. 68.

[26] This was one of the three characters employed by de Selys in 1860 to separate *Palaemnema* from its supposedly nearest ally, *Platysticta* Selys, of tropical Asia and Oceanica, in which the superior sector of the triangle ends proximad of the mid-length of the wing. No individuals of *Platysticta* are before me, but from the figures published by Kirby (Proc. Zool. Soc., Lond., 1891, pl. 20, fig. 3; Journ. Linn. Soc., Zool., XXIV, pl. 42, fig. 1, 1894), Needham (Proc. U. S. N. M, XXVI, pl. 53, fig. 3, 1903), Laidlaw (Rec. Indian Mus., XIII, pl. 15, fig. 4, 1917) and Munz (Mem. Amer. Ent. Soc., 3, pl. 19, fig. 137, 1919—this last reproduced here as our text-figure 2), it is evident that the origins of the nodal and ultranodal sectors also are more proximal than in *Palaemnema*.

The second character given by de Selys in 1860 distinguishing *Palaemnema* from *Platysticta* was that of the greater height of the cells of the apex of the wing which is mentioned above, while the third was that the sectors of the arculus arise separately from the same point, while in *Platysticta* they arise from a short common stalk. The value of this differential was diminished by de Selys himself by his statement for *Platysticta maculata*. I have not tabulated the variations in the mode of origin of these two sectors in *Palaemnema* but I have noted their origin from a common stalk in five wings (3 front, 2 hind) of as many individuals of *Pal. mutans*. In all of these cases the upper sector comes off from the anterior side of the quadrilateral at from .15 to .6 of the length of the latter measured from the arculus. In two wings of two other individuals the upper sector begins as a "floating" vein, .29–.42 mm. from the arculus, having no connections with the latter or with the lower sector (short sector, de Selys). One of the five wings just mentioned combines both of these features, viz., originating at midlength of the anterior side of the quadrilateral and also as a "floating" vein, as shown in our figure 27, Plate I.

wings appear to have almost, if not quite, as many cells in this region wider than high so that an actual count of the cells would be required to determine which shape is in the majority. Such a tabulation has not been made.

Abdomen

Tenth segment of both sexes unarmed and with no marked excision on its hind margin.

Superior abdominal appendages of the male forcipate, with a tooth on the supero-internal margin in most species, but not all (e.g., *P. croceicauda*), and beyond this tooth enlarged into a flatter lamella in the terminal two-fifths to one-third. Inferior abdominal appendages of the male but little shorter than the superiors, less curved, with a spine or a conical tooth on the inner margin near the base.

Penis ending in two slender filaments whose apices are enlarged and more or less deeply bilobed according to the species.

No apical ventral spine on the 8th abdominal segment of the female (100).

Color

Predominantly black, dark brown, or dark violaceous, often with a dark green, dark blue or cupreous reflection, with the following parts pale blue, yellow or cream-colored according to the species: labrum (except its free margin, which is black), rhinarium (anteclypeus), nasus (postclypeus) in part or in whole (in some species), labium in part, prothorax in part, an antehumeral stripe or spot (in some, not all, species), parts of the mesepimeron, metapleuron and metasternum (but always with a black or brown stripe on the second lateral thoracic suture,[27] separating the met(an)episternum from the metepimeron, and always with the posterior margin of the metepimeron, immediately above the latero-ventral carina, narrowly edged with black or dark brown [see figs. 72–75, Pl. XVIII]), a transverse band at the anterior end of abdominal segments 3–7, frequently interrupted mid-dorsally on segment 3; often the dorsal surface, in whole or in part, of segments 8–10 according to the species; much of the legs, especially the lower surface of the femora and the upper surface of the tibiae.

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[27] Metapleural suture of Garman, Dragonflies of Conn., fig. 1, (1927).

Discussion of Certain Generic Characters

Lower Sector of the Triangle

The great reduction, or total disappearance, of what de Selys called the lower sector of the triangle, constituting as it does the distinctive character of his legion Protoneura and of the equivalent taxonomic groups of later authors, gives especial interest to the conditions presented by this vein[28] in *Palaemnema*. An examination of the wings of three hundred and fifteen males, sixty-three females of the present material shows that in a very large majority (95.25% front, 97.5% hind wings) his descriptions hold good: "Le secteur inférieur du triangle consistant en une transversale oblique *allant de bas en haut* dans l'espace sous le quadrilatère" (1860); "Le rudiment du secteur inférieur du triangle . . . part de la nervule basale postcostale normale, . . . et il forme avec cette nervule postcostale un triangle en aboutissant obliquement au côté inférieur du quadrilatère un peu après son origine" (1886). The slight variation from these statements, 4.75% in the front and 2.5% in the hind wings (or 37 front and 19 hind wings respectively), is, nevertheless, worthy of some consideration.

A point worth noting is that of these thirty-seven front and nineteen hind wings, twenty-four and seventeen respectively are furnished by the one species, *P. mutans*, although the total number of individuals (82♂, 10♀) of this species examined is not much greater than those of two other species (*brucei*, 78♂, 2♀, and *clementia*, 69♂, 21♀) which have afforded but four and three front wings, respectively, and no hind wings, showing variations in this same vein.

Proximal end of the lower sector (anal bridge, *Ab* of Tillyard, Laidlaw and Fraser). In only six front wings (.79%), of five males, does this vein begin elsewhere than at the basal postcostal cross-vein (*Ac* of later authors), viz., at the hind margin of the wing distad of this cross-vein (see fig. 12, Pl. I). It is of interest that this condition is also found in the Oriental genus *Drepanosticta* Laidlaw.[29]

[28] This part of the wing in the Zygoptera has been discussed by Calvert, 1903, Biol. Centr.-Amer., Neur., p. 133, footnote †; Williamson, 1913, "The Medio-anal Link in Agrioninae," Ent. News, XXIV, pp. 258–261; Tillyard, 1917, "Biology of Dragonflies," p. 64; Comstock, 1918, "The Wings of Insects," pp. 240–241; Fraser, 1924, Records Ind. Mus., XXVI, pp. 506–509.

[29] Records Ind. Mus., XIII, pp. 339, 341, pl. 15, fig. 5, (1917).

Distal end of the lower sector. In my tabulations, the distal end of this vein is, in 96% of the front wings and 97.5% of the hind wings, entered as ending at one-third or less of the posterior side of the quadrilateral, but this includes one front wing in which the termination was at one-fourteenth and two hind wings at more than one-third of the posterior side of the quadrilateral. The remaining 4% of front wings and 2.5% of hind wings comprise the conditions shown in our figures 13–22, Plate I.

The relative frequencies of the variations in the wings are as follows (315♂ + 63♀ = 100%):

	Front Wings		Hind Wings	
Ending barely distad of arculus (Fig. 13)	♂ .4 %		♂ .13%	
Ending at arculus (Fig. 14)	0		♂ .13%	
Ending proximad of arculus (Fig. 15)	♂ .26%		♂ .13%	
Distal end two-branched (Figs. 16–18)	♂ .26%		♂ .66%	♀ .26%
Incomplete (Figs. 19–21)	♂ .79%	♀ .26%	♂ .66%	
Absent (Fig. 22)	♂ 1.85%	♀ .13%	♂ .53%	
Totals	♂ 3.56%	♀ .39%	♂ 2.24%	♀ .26%
	.39%		.26%	
	3.95%		2.50%	

Of greatest interest are the cases where *Ab* is totally absent (Pl. I, fig. 22), since this is the condition found in *Alloneura*, *Nososticta* and *Isosticta* of the Old World and *Protoneura* and genera formed from it in the New.

Our figures will, perhaps, suggest a comparison with Col. Fraser's "Diagram showing evolution of the anal bridge as demonstrated in Group *Indoneura*,"[30] although in that series the bridge is directed posteriorly, and not anteriorly as it is in *Palaemnema*.

Supplemental Basal Postcostal Cross-Veins

When two supplemental basal postcostal cross-veins are present, the *position of the additional one* is shown in the following list:

[30] Records Ind. Mus., XXVI, p. 507, (1924).

	Front Wings	Hind Wings
Proximal to the level of the usual supplemental of the opposite side	1.01%	.20%
So placed that the usual supplemental of the opposite side is at a level midway between the two supplementals (Pl. I, fig. 28)		.20%
Distal to the level of the usual supplemental but proximal to the level of the first antenodal cross-vein (Pl. I, fig. 29)	.81%	2.64%
Distal to the level of the usual supplemental and also distal to the level of the first antenodal cross-vein (Pl. I, figs. 30, 31)	.61%	.81%
Distal to the level of the principal basal postcostal cross-vein (in such cases possibly not homologous with the four preceding categories) (Pl. I, figs. 32–35)		1.42%
Total	2.43%	5.27%
Actual number of wings	12	26
Total number of wings examined	492	491

The (usual) supplemental basal postcostal cross-vein is so small, absolutely and relatively, and would appear to have so little mechanical (adaptive) value to its possessor and yet, as stated on page 10, is so invariably present, that it must apparently be regarded as an essentially hereditary character unaffected by the environment. Were Campion still alive, he might be inclined to draw the same inferences from the varied positions assumed by these additional supplemental basal postcostal cross-veins as he did from the positions in which a third antenodal cross-vein has been observed.

Penis

The penis in many Odonata is delicate and its shape is much altered by shrinking in drying. Elsewhere[31] I have discussed this condition in the genus *Philogenia*. In *Palaemnema*, where the two terminal filaments have a certain diagnostic value for the species, I believe that little shrinkage occurs. Comparison of the penes of Costa Rican specimens of *paulirica* and *nathalia*, preserved in alcohol from the time of capture and examined under alcohol with a compound microscope (Zeiss ocular 2, objective C), shows little, if any, difference from specimens from

[31] Trans. Amer. Ent. Soc., L, pp. 9–11, (1924).

the same locality kept dry for an equal number of years. Moreover, a dried male each of *angelina* and of *reventazoni*, which had been placed in a relaxing jar, was, after softening, compared with a male of each of these two species, and from the same localities, which had been dry for some weeks, and I could find no differences, within each species, of the penis filaments of the two specimens. In every species of which more than one male has been accessible to me I have examined the penes of two or more individuals under the compound microscope, usually in strong sunlight. The procedure which I have adopted to enable repeated examination of the penis in dried specimens is as follows: After the specimen has been softened in an ordinary relaxing jar and, preferably, pinned and bristled,[32] the head of the pin is thrust into a bit of plasticene on a microscopic slide and the insect, ventral side up, brought into the field of a binocular microscope (Greenough type). The distal end of the penis, while still soft, is carefully withdrawn from under the vesicle but not detached. A bit of white paper, 2 to 3 mm. long and, say, half as wide, pointed at one end, is introduced, pointed end first, by means of a fine forceps between the penis and the ventral surface of the abdomen. A still smaller bit of paper is then slipped between the reflexed terminal filaments and the straight part of the penis so that the filaments may be kept completely ventrad of the latter. The specimen may then be set aside to dry and, after a day or longer, the bits of paper may be carefully withdrawn for better examination of the details, but it is not advisable to try to reinsert them without relaxing the specimens again, as I have found to my sorrow. Specimens which I have prepared in this manner have remained with the penis as available for examination after nine years as when first dried and without any need of a second relaxation. Those with more delicate fingers than mine will doubtless succeed with smaller bits of paper than I have used and which are much larger than need be. It is much to be regretted that certain students of penes, who have examined many specimens in our American museums, have not prepared their objects of study in some such manner as here described, so that their findings can be checked up without the necessity of again relaxing the individuals which they employed.

[32] As directed in Trans. Amer. Ent. Soc., xx, p. 214, (1893).

Abdominal Appendages (Male)

Both the superior and inferior appendages of the males offer characters of specific value and I am inclined to think that much reliance may be placed upon their form in individuals which have passed beyond the teneral stage. In order to examine them fully it is necessary that they be separated from each other and to accomplish this, after softening the dried insect in the ordinary relaxing jar, I have inserted either from above a wedge-shaped bit of white paper, of about 2 mm. at the wider end and 3 mm. long, between the appendages of the right and left sides, or from the side a similar piece between the superiors above and the inferiors below, as each individual case seemed to demand. The specimens so treated were set aside to dry and when this was accomplished the paper was removed. This divarication of the appendages is apparently accompanied by a partial rotation of each superior appendage, so that its superior margin moves laterad and ventrad with the result that in profile view the appendage appears narrower (dorso-ventrad) than it did before divarication. While I have endeavored to standardize the views under which both superior and inferior appendages are shown in the figures on Plates II–XVII, I must emphasize that it is necessary to examine specimens, which are compared with these figures, at various angles in order to be sure that a given specimen does or does not agree with our figures. I have not thought it desirable to make use of the potassium hydrate treatment of the appendages which Dr. Ris has employed.[33]

Front and Hind Wings Compared

The following differences between the front and the hind wings of *Palaemnema* will often be found to hold good, although they are not invariable.

Front wings. Distal side of the quadrilateral distinctly longer than the proximal side, longer than the vein which continues it to the hind margin of the wing and more oblique, the anterior distal angle more than 90°, the posterior distal angle less than 90°, the anterior and posterior sides distinctly divergent distad;

[33] Archiv. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, p. 91, (1918).

upper sector of the triangle (Cu_1 of Comstock and Needham) ending less distad with respect to the level of origin of the ultra-nodal sector.

Hind wings. Distal side of the quadrilateral little, if any, longer than the proximal side, not longer than the vein which continues it to the hind margin of the wing and less oblique, both distal angles nearly 90°, anterior and posterior sides nearly parallel; upper sector of the triangle ending more distad with respect to the level of origin of the ultra-nodal sector.

Geographical and Topographical Distribution

According to present information, the genus *Palaemnema* extends from the northern part of the State of Puebla, Mexico (20° North Latitude, 98° West Longitude), to the southern part of Peru (10° South Latitude) and to the northern part of Venezuela (67° West Longitude), but no species have yet been reported from Salvador, Nicaragua, Ecuador or northern Peru. With the exception of a single female from Zapote, Guatemala (by Champion), and possibly a pair from the Isthmus of Tehuantepec, the Pacific slope from Mexico to central Costa Rica is unrepresented, in spite of the careful collecting of Herbert H. Smith in Guerrero and of G. C. Champion and E. B. Williamson in Guatemala. Although five species of *Palaemnema* are listed in the present paper from the Atlantic slope of Mexico, two are represented by only one specimen each, one by three specimens, one by seven, one by eight. Much, therefore, remains to be learned concerning intraspecific variation, specific limits and areas of distribution. The general distribution of the species is given in the following list:

Mexico

Pacific drainage?	Atlantic drainage
P. domina	*P. paulicoba*
	P. paulitoyaca
	P. desiderata
	P. paulicaxa
	P. paulitaba

Guatemala

Pacific drainage	Atlantic drainage
P. sp. (1 ♀)	*P. angelina*
	P. nathalia

Honduras

Atlantic drainage
P. paulina
P. angelina

Costa Rica

Pacific drainage	Atlantic drainage
P. distadens	*P. paulirica*
P. nathalia	*P. distadens*
	P. gigantula
	P. reventazoni
	P. nathalia
	P. chiriquita
	P. melanota

Panama

Pacific drainage	Atlantic drainage
P. nathalia	*P. brucei*

Colombia

Pacific drainage	Magdalena-Cauca drainage	Coastal Caribbean drainage
P. carmelita	*P. brucei*	*P. clementia*
	P. carmelita	
	P. clementia	
	P. croceicauda	Orinoco drainage
	P. edmondi	*P. apicalis*

Venezuela

Maracaibo drainage	Coastal Caribbean drainage
P. mutans	*P. melanostigma*
P. clementia	*P. clementia*

Peru

Amazon drainage
P. azupizui
P. peruviana

The greatest altitudes known for the genus are 925 m. (3035 ft.) in Mexico (*P. paulicaxa*), 1060 m. (3500 ft.) in Costa Rica (*P. distadens*), 2000 m. (6560 ft.) in Colombia (*P. carmelita*). Some species have been found at sea-level in Panama and Colombia (*P. distadens, P. brucei*).

The following from a letter of August 1, 1923, by Mr. E. B. Williamson, gives a picture of these insects in their native haunts. "Wherever we found *Palaemnemas* in South America there was always a marked similarity in their habits though the habitats might vary from a steep hillside to a low, damp, level spot along a woodland creek. They are all forest dwellers and they like places where logs or larger branches lie about and the vegetation is not too dense—pretty scattered, like little bushes—not at all grass or sedge dwellers. Often when I'd find one, I'd lay the net down and go crawling about looking for them and picking them by hand. They are mighty inconspicuous to one standing upright, but creeping about I'd often have several in view at once. And they were easily captured if I didn't go flapping into their midst with a net. You'll find large numbers, I think, from La Fria and we caught many or most of them in this way. I can see the spot now along the Quebrada La Fria where I caught a lot one afternoon—and I can see a dozen of these little beauties sitting on low twigs or fallen leaves with upturned edges."

In the following pages, under the caption "Habitats and Habits" for each species, the collector's account of the locality in which the species was found and of such actions as it may have displayed is given wherever possible. General sources available for these topics have been Dr. Baker's paper on Mexico,[34] Mr. Williamson's on Colombia[35] and Venezuela[36] and the writer's book on Costa Rica.[37]

Seasonal Distribution

Most of the collections which include *Palaemnema* have been limited in time to a portion only of the year and, therefore, furnish only the positive evidence that this genus occurs in certain months. All of the data brought together in the following pages show that, outside of Costa Rica, the collections examined

[34] Mexican Mollusks collected for Dr. Bryant Walker in 1926, I. Occas. Papers, Mus. Zool. Univ. Mich., No. 193, (April 2, 1928).

[35] A Collecting Trip to Colombia, South America. Univ. Mich. Mus. Zool., Misc. Publ., No. 3, (Feb. 22, 1918).

[36] Notes on the Habitats of some Tropical Species of Hetaerina (Odonata). Occas. Papers, Mus. Zool. Univ. Mich., No. 130, (Feb. 10, 1923).

[37] A Year of Costa Rican Natural History. By A. S. and P. P. Calvert. New York. The Macmillan Co., (1917).

were made in the months January to July inclusive. We know nothing as to whether adult *Palaemnemae* are to be seen in the other months of the year in Mexico, Guatemala, Panama, Colombia or Venezuela.

The only attempt made thus far to determine whether there is a seasonal distribution of *Palaemnema* (and of other genera of Odonata within the tropics) is that of Mrs. Calvert and the writer in Costa Rica from May 1, 1909, to May 8, 1910. The results for *Palaemnema* are as follows: On the Atlantic slope of this country, where no sharp distinction of wet and dry seasons can be made, owing to the frequent rains, imagos (7 species) were found only between April 13th and August 10th with a single exception, viz., one male (of *P. distadens*) at Banana River, near sea-level, on November 6, 1909. A male of this species was found transforming at Juan Viñas, 3400 ft., on August 2, 1909, June 28th to August 3rd being the dates between which this species was found in that general vicinity (2500–3400 ft.). *P. reventazoni* was taken below Juan Viñas (2500 ft., near the river) on June 28 and July 28, 1909, and two imagos, which had just transformed, were obtained in precisely the same spot on May 1, 1910.

On the Pacific slope of Costa Rica only two species of this genus are known, *P. distadens* and *P. nathalia*, both of which also occur on the Atlantic side of that country; the dates when they were secured were August 13–15th at Turrúcares, September 3rd and 4th at Alajuela and October 17th at Rio Surubres. All these dates fall in the wet season, which, on the Pacific slope, is quite distinctly marked from the dry season. None of the dry season collections made by the late Professor P. Biolley at Rio Surubres and other points on the Pacific slope, January to July 1905–07, nor by the writer at Turrúcares, December 19–23, 1909, April 9–10, 1910, and at various points in Guanacaste and Puntarenas, January 6 to February 2, 1910, contained a single individual of *Palaemnema*. Species of *Palaemnema* were several times encountered in company with species of *Philogenia*. Elsewhere we have recorded[38] that *Ph. carrillica* has been taken on the Atlantic slope of Costa Rica "at one station or another in

[38] These Transactions, L, pp. 14, 45–46, (1924).

every month, except January, February and March; at the two stations at Juan Viñas they were collected from April to July inclusive, in October and in December. . . ." For *Ph. terraba*, of the Pacific slope of Costa Rica, we have a record of a female taken in March (dry season) and of two males and a female in October (wet season), all at the same station on the Rio Surubres. ". . . Bearing in mind the habitat of *Philogeniae*—in forests and generally near brooks and waterfalls—the probability is that this genus may appear at any time of the year in these habitats."

As stated above, imagos of *Palaemnema* have, on a number of occasions, been found associated in Costa Rica with imagos of *Philogenia*, but the latter have been met throughout most of the year. The absence of *Palaemnemae* from *Philogenia* habitats at certain periods suggests that *Palaemnemae* have a more narrowly limited seasonal distribution and are to be considered as wet season species, although not flying for the entire length of that season. The predominance of Atlantic drainage species of *Palaemnema* over Pacific drainage species in Mexico and Central America agrees with this interpretation of the seasonal range and suggests also that the Pacific slope species have migrated thence from the moister Atlantic side.

Classification of the Species

The key for the identification of the species, which is presented below, has its first dichotomy based on the color of the propleuron, since this is one of the few specific characters of any kind which is possessed by both sexes of what appear to be the same species. My preference would be to base the first and as many other dichotomies as possible upon structural, rather than upon color differences, but, although many structural characters, both in the terminal abdominal appendages and in the penes, are available to distinguish the males specifically, I have been unable to find any structural features in the females which may be correlated with those of the males. I assume that a character common to both sexes of a species, even if it be but slight and colorational, is of greater genetic and taxonomic significance than one possessed by but one sex, especially if the latter character is not known to be correlated with some peculiarity of the other sex.

But it also should be pointed out that a grouping of the species of *Palaemnema* into those with dark and those with pale propleuron does not coincide with a division based on two obvious forms of penis-filament tips, or on two forms of apex of the superior appendages of the males, nor do the latter two groupings agree with each other. The following lists show what differences result from the three modes of procedure. I have no explanation for these divergences, but the first, or propleural-color, classification appears to me to be based on a more fundamental characteristic, as explained above.

Classification of both sexes based on propleural color	Classification of males based on bilobation of penis-filament tips	Classification of males based on shape of apex of superior appendages
Propleuron black or dark brown	Bilobation form A[39]	Apex not, or but slightly, excised
P. paulirica	*P. paulirica*	*P. paulirica*
P. distadens	*P. distadens*	*P. distadens*
P. paulina	*P. paulina*	*P. paulina*
P. paulicoba	*P. paulitoyaca*	*P. paulicoba*
P. paulitoyaca	*P. desiderata*	*P. paulitoyaca*
P. desiderata	*P. angelina*	*P. desiderata*
P. paulicaxa	*P. apicalis*	*P. paulicaxa*
P. paulitaba	*P. nathalia*	*P. paulitaba*
P. angelina	*P. clementia*	*P. domina*
P. domina	Bilobation form B	*P. peruviana*
P. mutans	*P. paulicoba*	*P. melanostigma*
P. peruviana	*P. paulicaxa*	*P. brucei*
P. melanostigma	*P. paulitaba*	*P. azupizui*
P. gigantula	*P. mutans*	*P. apicalis*
P. brucei	*P. melanostigma*	*P. carmelita*
P. azupizui	*P. gigantula*	*P. nathalia*
P. apicalis	*P. brucei*	*P. clementia*
P. carmelita	*P. azupizui*	*P. croceicauda*
P. reventazoni	*P. carmelita*	*P. edmondi*
Propleuron pale blue or yellowish	*P. reventazoni*	*P. melanota*
P. nathalia	*P. croceicauda*	Apex deeply excised
P. clementia	*P. edmondi*	*P. angelina*
P. croceicauda	*P. chiriquita*	*P. mutans*
P. edmondi	*P. melanota*	*P. gigantula*
P. chiriquita	Not investigated	*P. reventazoni*
P. melanota	*P. domina*	*P. chiriquita*
	P. peruviana	

[39] For explanation of these forms A and B, see the "N. B." under the first rubric of the following key.

Key to the Species of Palaemnema

I. Propleuron chiefly black or dark brown.

MALES

N. B. The apex of the inferior appendages is characteristic for each species; since its description in a few words is often difficult, reference should be made to the figures in attempting identification. The form of bilobation of the tips of the penis-filaments is indicated in this key by the letters A and B, viz.: A = sinus between the lobes narrower than deep, its sides subparallel, as in figs. 42E, 46E, Plate III; B = sinus between the lobes wider than deep, its sides converging inward, as in fig. 53E, Plate VIII. These are the two forms alluded to in Ent. News, XXXIII, p. 156, 1922.

A. Superior appendages as shown in Plate VIII, figure 54A, with no sinus or notch between the superior tooth and the widening of the ventral margin when the appendage is viewed from above; the inferiors only .6 as long as the superiors; pale (blue) antehumeral stripe extending the entire length of the mesepisternum, narrower than the combined fused humeral and first lateral dark stripes; a dark stripe on the metepimeron ventral to and fusing with that on the second lateral suture. . . . . *domina* (Mexico)

AA. No such combination of characters

B. Abdominal segments eight and nine chiefly blue on dorsum

C. Metepimeron with a brown or black longitudinal stripe dorsal to the latero-ventral carina, but distinct from the dark stripe on the metapleural suture (except in *P. paulicaxa*), extending in most cases (*except in Costa Rican forms*) across the carina and on to the metasternum; *mature* males with dark brown at the apices of the wings (except in *P. distadens*)

D. Apex of superior appendages not deeply excised at 90°, the superior margin not prolonged as an overhanging process

E. Blue antehumeral stripe extending for almost the entire length of the mesepisternum (broken into separated spots in its upper three-tenths in *P. paulicaxa*)

F. Metasternum with no dark stripes or markings behind the 3rd legs; blue antehumeral stripe only a little wider in its lower half (.65–.33 mm.) than at midheight (.5–.16 mm.); penis form A

G. Superior appendages with the superior tooth at .33–.43 of the appendage-length, apex of appendage very slightly excised in an angle much greater than 90°; blue antehumeral stripe at midheight wider (.25–.5 mm.) than the black humeral (.15–.22 mm.), except in those males in which dark humeral and first lateral stripes are fused (.77 mm.); distal one-twelfth to one-sixth of wings dark brown in mature males *paulirica* (Costa Rica)

GG. Superior appendages with the superior tooth at .53–.62 of the appendage-length, apex of appendage rounded, not at all excised; blue antehumeral stripe at midheight narrower (.10–.36 mm.) than the black humeral (.25–.55 mm.); no males yet found with dark brown at wing-apices *distadens* (Costa Rica)

FF. Metasternum with dark stripes or markings behind the third legs

H. Blue antehumeral stripe markedly widened in its lower half (.65–.7 mm.) as compared with width at midheight (.33–.41 mm.); superior tooth of superior appendages at .3 of appendage-length

J. Terminal hook of the inferior appendages shorter (.03 mm.); distal one-eighth to one-twelfth of wings dark brown; penis form A *paulina* (Honduras)

JJ. Terminal hook etc. longer (.078 mm.); distal one-seventh of wings dark brown; penis form B . . . . . *paulicoba* (Mexico)

HH. Blue antehumeral stripe only a little wider in its lower half (.82, .5 mm.) as compared with width at midheight (.65, .33 mm.)

K. Superior appendages with superior tooth at .3–.41 of appendage-length; distal one-seventh to one-tenth of wings dark brown; penis form A. . . . . *paulitoyaca* (Mexico)

KK. Same tooth at .24 of appendage-length; distal one-fourth of wings dark brown; penis form A. . . . . *desiderata* (Mexico)

KKK. Same tooth at .6 of appendage-length; distal one-fourth of wings dark brown; penis form B; blue antehumeral stripe broken into isolated spots in upper .3 *paulicaxa* (Mexico)

EE. Blue antehumeral stripe confined to the lower .6 of the mesepisternum; at midheight of the sclerite this stripe is twice as wide as the black humeral stripe (exclusive of the mesepimeral black which in some examples is connected with the humeral stripe) or the humeral stripe reduced to a mere line; superior appendage with apex not excised, superior tooth at .35–.41 of appendage-length; distal one-fifth to one-sixth of wings dark brown; penis form B . . . . . *paulitaba* (Mexico)

DD. Apex of superior appendages deeply excised at 90°, superior margin prolonged as an overhanging process; blue antehumeral stripe as stated under E and F, metasternum as under FF; superior appendage with superior tooth at .30–.38 of appendage-length; distal one-eighth to one-fifteenth of wings dark brown in mature males, uncolored in immatures; penis form A *angelina* (Guatemala, Honduras)

CC. Metepimeron with no brown or black longitudinal stripe, no dark stripes or markings on the metasternum behind the third legs; mature males with no dark brown at apices of wings; penis form B (unknown in *peruviana*); superior tooth of superior appendages at .44–.63 of appendage-length

L. Abdomen (34–41 mm.) 1.6 times (or less) as long as hind wing (21.5–27 mm.); a pale antehumeral stripe or spot present on at least the lower end of the mesepisternum; mesinfraepisternum chiefly black, pale inferiorly

M. Superior appendages with apex excised at 90°, the superior margin prolonged as a projecting process; blue antehumeral stripe very short (.16–.5 mm.), lying immediately behind the anterior mesepisternal margin (often faded in dried specimens) *mutans* (Venezuela)

MM. Superior appendages not, or but slightly, excised at apex

N. Basal tooth of inferior appendages represented by a blunt tubercle; black markings of abdominal segment nine consisting of an inferior longitudinal stripe each side as long as the segment *peruviana* (Peru)

NN. Basal tooth of inferior appendages slender, spinelike, about one-half as long as the width of the apex of the superiors; black markings of abdominal segment nine consisting, in addition to the stripe described for *peruviana*, of a transverse dorsal stripe at each end of the segment. . . . . *melanostigma* (Venezuela)

LL. Abdomen (47–48 mm.) 1.8 times as long as hind wing (25.5–26.5 mm.); no pale antehumeral stripe or spot; mesinfraepisternum pale blue; superior appendages curved strongly from base to apex in profile view, the convexity dorsal, apex excised at 90° or more, superior margin produced in an overhanging process having the form of almost the quadrant of a circle *gigantula* (Costa Rica)

BB. Abdominal segment eight chiefly black;[40] no dark metepimeral or metasternal stripes as described in rubric C

O. Dorsum of abdominal segment nine blue; penis form B

P. Superior appendages and antehumeral stripe as described above under rubric M. . . . *mutans* (Venezuela)

PP. Superior appendages not excised at apex, the superior tooth at .4–.6 of the appendage-length

Q. Pale antehumeral spot inferior, obcuneate, .33–.65 mm. long; hindmost one-fourth to one-fifth of dorsum of abdominal segment eight blue *brucei* (Panama, Colombia)

QQ. Pale antehumeral spot or stripe absent; no dorsal blue on abdominal segment eight. . *azupizui* (Peru)

OO. Dorsum of abdominal segment nine black

[40] I have before me a single male of *P. melanostigma* in which abdominal segment eight is chiefly black, but the type male and two others have this segment blue; hence the species has been placed under rubric B. Occasional males of *P. distadens* also have abdominal segments eight and nine black.

R. Superior appendages with apex not excised, superior tooth at .43 of appendage-length; basal tooth of inferiors about one-fourth as long as width of apex of superiors; penis form A; mesepimeron and posterior half of *mes*episternum ferruginous brown which at midheight is 1.00 mm. wide..... *apicalis* (Colombia)

RR. Superior appendages with apex not excised, superior tooth at .48–.53 of appendage-length; basal tooth of inferiors at most a blunt or triangular tubercle; penis form B; mesepimeron and *met*episternum obscure bronze violet..... *carmelita* (Colombia)

RRR. Superior appendages excised in an obtuse angle, superior margin produced in an overhanging process which is as long as wide, superior tooth at .4–.43 of appendage-length; basal tooth of inferiors shorter than one-half of the width of apex of superiors; penis form B; mesepimeron black *reventazoni* (Costa Rica)

FEMALES[41]

S. Abdominal segment nine brown or black, with a pair of blue or yellow spots which may or may not be confluent on the mid-dorsal line; eight brown or black, no pale marks on dorsum

T. Pale antehumeral stripe uninterrupted, occupying .6 or more of the length of the mesepisternum; apices of wings uncolored or faintly brownish

U. Metepimeron with a brown stripe dorsal to the latero-ventral carina but distinct from the brown stripe on the metapleural suture, no brown or black stripe on the metasternum; blue antehumeral stripe .22–.35 mm. wide at midheight; costal edge of stigma, front wing, 1.33–1.48 mm..... *paulirica* (Costa Rica)

UU. Metepimeron and metasternum without brown or black stripes other than that on the metapleural suture; blue antehumeral stripe .07–.15 mm. wide at mid-height, narrower than the brown humeral (.22–.48 mm.); costal edge of stigma, front wing, .96–1.33 mm. *distadens* (Costa Rica)

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[41] Owing to the condition of the only known female of *P. domina*, I have been obliged to omit it from this key.

UUU. Metepimeron with a black or dark brown stripe dorsal to the latero-ventral carina (but distinct from the brown stripe on the metapleural suture) continued across the carina on to the metasternum; blue antehumeral stripe .16–.25 mm. wide at midheight, narrower than, or equal to, the black humeral stripe (.16–.33 mm.); costal edge of stigma, front wing, 1.23–1.31 mm. . . . . *angelina* (Guatemala, Honduras)

TT. Pale (blue) antehumeral stripe divided into a stripe on the lower .6 of the mesepisternum and a spot near the upper end of the sclerite; apices of the wings dark brown for 1.00–2.00 mm.; a dark stripe on the metepimeron as described in rubric UUU in both females seen, but continued on to the metasternum in only one of them; dark humeral stripe ill-defined; costal edge of stigma, front wing, 1.00 mm. . . . . *paulitaba* (Mexico)

TTT. Pale antehumeral stripe confined to the lower half of the mesepisternum, no dark metepimeral or metasternal markings as described in rubric UUU; a small, well-defined, greenish-yellow spot on each side of each pronotal lobe. . . . . *melanostigma* (Venezuela)

TTTT. Pale antehumeral stripe or spot confined to the lowest one-tenth of the mesepisternum or absent; no dark metepimeral or metasternal markings as described in rubric UUU; pale spots on pronotum, if present, not well marked

V. Pterostigma (in strong sunlight) sepia, maximum width .74 mm. . . . . *brucei* (Colombia)[42]

VV. Pterostigma (in strong sunlight) dragon's blood, width .86 mm. . . . . *mutans* (Venezuela)

SS. Abdominal segments eight to ten obscure, blackish, unmarked, or with only a trace of obscure bluish on the middle of each side of each segment in dorsal view; no pale humeral or antehumeral stripe or spot

W. Abdomen (39 mm.) 1.26 times as long as hind wing (31 mm.). . . . . *carmelita* (Colombia)

WW. Abdomen (40 mm.) 1.5 times as long as hind wing (26.5 mm.), mesinfraepisternum blue *gigantula* (Costa Rica)

[42] I am not certain whether I have correctly interpreted the living colors of the eighth and ninth abdominal segments of the two Colombian females referred to this species, or whether in life these segments were as stated in rubric SS.

II. Propleuron pale blue or yellowish; apex of wings uncolored or faintly smoky.

MALES

The "N. B." of page 24 under "I, Males" applies here also.

a. Pale antehumeral stripe or line present

b. Antehumeral stripe blue, at least .15 mm. wide; dorsum of abdominal segments eight and nine blue, or perhaps violaceous in some, of ten black; tips of wings in mature individuals smoky in costal and median cells, or even farther posteriorly, from distal end of stigma, or barely tinted; superior appendages with the ventral margin not angulated, apex not excised; penis form A

c. Black or brown metepimeral-metasternal stripe absent; superior tooth of superior appendages at .27–.4 of appendage-length . . . . . *nathalia* (Guatemala to Venezuela)

cc. Black or brown stripe extending from the hind end of the metepimeron across the latero-ventral carina and on to the metasternum almost to the 3rd coxa; superior tooth of superior appendages at .38–.48 of appendage-length *clementia* (Colombia, Venezuela)

bb. Antehumeral line greenish-yellow, .08 mm. wide; dorsum of abdominal segments eight to ten orange; wings uncolored throughout; entire mesepimeron rich maroon brown; no dark markings on metasternum; superior appendages with ventral margin barely angulated, apex very slightly excised at middle, no superior tooth; basal tooth of inferiors represented by the end of a carina; penis form B . . . . . *croceicauda* (Colombia)

aa. Pale antehumeral stripe or line absent, mesinfraepisternum mostly blue; superior appendages with ventral margin not angulated, superior tooth present; penis form B

d. Abdominal segments eight to nine or ten blue on dorsum (except for anterior one-seventh or less of eight, which is black)

e. Superior appendages with apex not excised, superior tooth at .5–.6 of appendage-length; basal tooth of inferiors a blunt tubercle, no anteapical spine on the same appendages . . . . . *edmondi* (Colombia)

ee. Superior appendages with apex excised at 90°, the superior margin prolonged as a process shaped like the quadrant of a circle, superior tooth at .43 of appendage-length; basal tooth of inferiors more slender, spine-like, a slender, anteapical spine on the same appendages *chiriquita* (Costa Rica)

dd. Abdominal segments eight to ten blackish; superior appendages with apex excised inferiorly, superior tooth at .6 of appendage-length; basal tooth of inferiors a blunt or triangular tubercle, no anteapical spine on the same appendages.....*melanota* (Costa Rica) [43]

FEMALES

f. Abdominal segments eight and ten obscure brownish or blackish, nine with a blue spot, usually longer than half of the segment, on each side of the dorsum; synthoracic dorsum brown or black with some metallic reflection; fore pronotal lobe, viewed from behind, with an angular lateral projection (Plate II, fig. 41 p_1).

g. Metepimeral-metasternal dark stripe absent; upper and lower ends of a pale antehumeral stripe visible in some specimens (stripe complete in Gualan ♀); front wings with 20–26 postnodals, nodal sector arising at the eighth or ninth.....*nathalia* (Guatemala to Venezuela)

gg. Metepimeron with a brown stripe extending from the hind end, above the latero-ventral carina, crossing the carina on to the metasternum and reaching almost to the third coxa; front wings with 18–23 postnodals, nodal sector arising at the seventh to ninth
clementia (Colombia, Venezuela)

ff. Abdominal segments eight to ten orange on dorsum, a very narrow, transverse, basal, black ring on eight and an inferior, longitudinal, black stripe on each side of eight to ten; side of fore pronotal lobe less angular; no dark metepimeral-metasternal stripe; a narrow (.08 mm.), greenish yellow, antehumeral line; front wings with 15–17 postnodals, nodal sector arising at the sixth to seventh..*croceicauda* (Colombia)

fff. Abdominal segments eight and nine brown, each with a blue spot on each side of dorsum, longer than half of the segment; synthoracic dorsum dark shining green, no pale antehumeral stripe or line; no lateral projection on the fore pronotal lobe; no dark metepimeral-metasternal stripe; front wings with 15–17 postnodals, nodal sector arising at the sixth to seventh.....probably *melanota* (Costa Rica)

[43] Whether *P. melanota* falls under this rubric or not is uncertain. Only one male, the type, is known; of it Dr. Ris in his original description wrote: "8–10 ganz schwarz (nicht ganz sicher, Färbung hier nicht gut erhalten)." This type is before me; segments seven to ten and the appendages were evidently subjected to the potash treatment employed by Dr. Ris and are now dull ochre, except for the small, lateral, rounded tubercles (so often present in this genus at the hind margin of each of these segments) which have remained black. As segment seven is universally black in *Palaemnema*, the fact that eight to ten have now nearly the same coloring as seven possesses is, perhaps, some evidence that eight to ten were also black originally.

Descriptions of the Species

Palaemnema paulirica new species (Pl. II, figs. 42A–C, F–K, apps. ♂; Pl. III, figs. 42E–E‴, penis, L, M, genitalia of abd. seg. 2, 43 clypeus, labrum; Pl. XVIII, figs. 70, 71, thoracic pattern.)

1917. *Palaemnema paulina* A. S. & P. P. Calvert, A Year of Costa Rican Natural History, p. 275. (Rio Guapiles, Costa Rica; habits.)

1918. *Palaemnema paulina* forma *c* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, pp. 92, 94, fig. 49 (apps. ♂). (Tuis, Turrialba, Costa Rica; 1♂, 1♀.)

1918. *Palaemnema melanota* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, p. 99 ("Das zweite ♂" only). (Tuis, Turrialba, Costa Rica.) [For discussion of this synonymy, see *posteà* under *P. melanota*.]

Material examined. Costa Rica: Rio Guapiles, north of the town of Guapiles, June 2 and 5, 1909, P. P. Calvert collector, 19♂, 5♀. Turrialba, 2300 feet (700 meters), July 26, 1909, same collector, 1♂. Tuis, Turrialba, 1000 m., 1913, O. Garlepp collector, 1♂ in Coll. Ris, the original of the description and figure of 1918.

Type. Male, Rio Guapiles, June 5, 1909, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

Paratypes. All the remaining specimens from Rio Guapiles.

The following description is based on the dried specimens.

♂. Lateral extremities of the transverse occipital carina varying from angulate through subangulate to rounded, in some individuals the two extremities different. Nasus black, often with a pale spot each side.

Pronotum chiefly blue, a mid-dorsal black stripe on all three lobes, narrower than the lateral blue on the fore lobe, wider than the lateral blue on mid and hind lobes. Propleuron black, a small pale spot at the antero-inferior angle of the epimeron.

Blue antehumeral stripe narrowed above, varying in width at midheight from .26 to .44 mm. Black humeral stripe, when not fused with the black of the first lateral thoracic suture or of the posterior part of the mesepimeron, from .15 to .22 mm. wide at midheight; when so fused the combined width is .74–.82 mm. (Compare Pl. XVIII, figs. 70, 71.) Mesinfraepisternum black, a tendency to pale at the postero-inferior angle, the posterior half paler (bluish?) in one ♂. A black stripe on the upper half of the obsolete first lateral thoracic suture (interpleural of Garman) which in fewer individuals (four from the Rio Guapiles, one Tuis) is connected below with the black humeral stripe. Black stripe on the second lateral thoracic suture (metapleural of Garman) .30–.67 mm. wide at midheight; for the metepimeral stripe, see the key *anteà*.

Tergites of abdominal segments eight and nine blue, a very narrow transverse basal line and an inferior longitudinal stripe on eight, a similar stripe on nine as long as the segment, black; ten black, a pair of dorsal blue spots in the majority, but not in all, of the individuals.

Apex of the wings uncolored in one teneral individual of June 5, in the remainder brown whose inner margin varies from the preantepenult postnodal to midlength of the stigma, the last mentioned in the Turrialba male of July 26 only. The following data apply to the males from Guapiles only. Postnodals: front wings 19–27 (22 and 23 most frequently, 21% each), hind wings 17–22 (20, 45%). Nodal sector arising: front wings, at the seventh to tenth postnodal (ninth most frequently, 37%); hind wings at the fifth to seventh (sixth, 76%). Ultranodal sector arising: front wings, at the ninth to twelfth postnodal (tenth, 55%); hind wings, at the seventh to tenth (ninth, 50%); or, in cells behind the median vein of de Selys, proximal to the stigma: front wings, 9–13 (11, 50%); hind wings, 8–13(11, 39%). Upper sector of the triangle ending at or beyond the level of the origin of the ultranodal sector: front wings, by 0 to more than 4 cells (3, 29%) in the area behind the ultranodal sector, or 0–8 marginal cells (3 and 5 each, 21%); hind wings, by 3 to 7 cells (6, 39%) behind the ultranodal sector, or 5–11 marginal cells (8 and 9 each, 13%). Cells surmounted by the stigma: front wings, 2 to more than 4 (3, 47%); hind wings, 2 to 4 (3, 34%).

Superior appendages with the angulation of the inferior margin, where the appendage enlarges, situated at .6–.67 of the appendage-length. Inferior appendages with the basal tooth as long as half the width of the apex of the superiors, slightly longer, or slightly shorter, than half this width in three and one individuals respectively; there is no convex enlargement on the mesal surface of the appendage distad of the anteapical curvature, no abrupt constriction as in *P. nathalia;* the lamellate extreme tip of the appendage is bent dorsad but is shorter (about .05 mm.) than in *nathalia* (.1 mm.). (Compare Pl. II, figs. 42F, 42G, and Pl. XV, figs. 64F, 64G.)

♀. Differences from the male in addition to those indicated in the key: Nasus as in the male, or chiefly bluish, black at base. Blue antehumeral stripe .22–.35 mm. wide at midheight. Brown humeral stripe .11–.15 mm. wide at midheight, but hardly distinct from the paler brown which lies between it and the black on the obsolete interpleural suture. Black stripe on the metapleural suture .37–.44 mm. wide at midheight.

Apex of the wings uncolored (teneral) or faintly brownish. Postnodals: front wings, 20–24 (23); hind wings, 17–20 (19 & 20).

Nodal sector arising: front wings, at eighth to ninth postnodal (8th); hind wings, at sixth to seventh (6th). Ultranodal sector arising: front wings, at ninth to eleventh (10th) postnodal, 9 to 12 cells (11) proximal to stigma; hind wings, at eighth or ninth (9th) postnodal, 9 to 11 cells (10) proximal to stigma. Upper sector of the triangle ending, with respect to the origin of the ultranodal, at 0 to 4 (4) cells as for the male, or 0–6 (2) marginal cells; hind wings at 3 to more than 5 (4) cells, or 5–9 (5) marginal cells. Cells surmounted by the stigma: front wings, more than 2 to more than 3 cells (more than 2 but less than 3); hind wings, more than 2 to 3 cells (more than 2 and 3 equally frequent).

Dimensions. Abdomen: ♂, 35–40; ♀, 32–35.5. Hind wing: ♂, 25.5–30; ♀, 25–28. Stigma: front wings, costal margin, ♂, 1.3–1.7, ♀, 1.3–1.5; hind margin, ♂, 1.4–1.8, ♀, 1.5; distal margin, ♂, .81, ♀, .74; proximal margin, ♂, .74–.89, ♀, .67–.81 —all in mm. Maximum width of front wing, also of hind wing ♂, 5.48 mm.

Habitats and Habits. The altitude of the town of Guapiles is about 300 meters so that the vertical range represented by the known material is 700 meters. This species has thus far been found only on the Atlantic slope of Costa Rica. The locality "Tuis" at which Garlepp collected is probably the "San Francisco de Tuis" of Pittier's map [44] of this country and if so lies to the south of the Rio Reventazón. The male which I took on July 26, 1909, was west of the town of Turrialba and to the north of the Reventazón. It was obtained in forest on a very steep slope, wherein were many exogenous trees, palms and tree ferns, all bound together with vines and lianas, and many of them armed with sharp thorns; so dense was the vegetation that Prof. J. F. Tristan and I were obliged to give up our plan of passing through it. Associated with this single male of *paulirica* were four males of *P. distadens*. A stream issued from the forest and passed into one of the beautiful, green, soft-looking pastures, then a striking feature of the vicinity of Turrialba. The *Palaemnemae* were not along this stream, however, but in the woods; their wings were held vertically at rest.

The specimens of *paulirica* secured near Guapiles were found in a narrow strip of woods and low, not very dense undergrowth bordering the Rio Guapiles and separated by grassy pastures

[44] Petermanns Geogr. Mitteilungen, Erganzungsheft, 175, (1912).

from banana fields lying farther east. Three species were associated here: *P. paulirica*, *P. nathalia* and *Heteragrion erythrogastrum* Selys. My notes for the two days at this locality, June 2 and 5, 1909, read: "There seemed to be no localization or topographic isolation of any one of the three species from the others. Most of the *Palaemnemae* taken June 5 were picked by my thumb and finger without use of net. In collecting them I did not consciously select sexes or species. Did not see any in copula. They seemed to prefer to remain six inches (1.5 cm.) or less above the surface of the ground. These individuals would keep the body motionless in the same spot in the air while the wings moved rapidly, giving somewhat the suggestion of a Syrphid. Looked carefully along river banks, under stones and in sheathing bases of plant leaves of various kinds for larvae, but found none."

Palaemnema distadens new species (Pl. III, figs. 46E, L, M, genitalia ♂; Pl. IV, figs. 46A–C, F–K, apps. ♂; Pl. XVIII, fig. 72, thoracic pattern.)

1918. *Palaemnema angelina* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, pp. 93, 95, fig. 50 (apps. ♂). (Tuis, Turrialba, Costa Rica; 1♂.)

Material examined. Costa Rica: Atlantic slope: Quebrada Honda, 3500 ft. (1060 m.), August 1, 1909, 2♂. Juan Viñas, near the railroad, 3400 ft. (1030 m.), July 22–August 3, 1909, 2♂, 6♀. Juan Viñas, in the Reventazón valley, 2500 ft. (760 m.), June 28, 1909, 1♂, July 28, 3♂, 1♀. Turrialba, 2300 ft. (700 m.), July 26, 1909, 4♂, 1♀, and July 27 (Rio Azul), 1♂. Banana River country, Philadelphia South Farm, less than 30 m., November 6, 1909, 1♂—all collected by P. P. Calvert. Chitaria, on slopes of Volcan Turrialba, 600 m. (1960 ft.), June 9, 1929, 2♂, M. Valerio, collector. Estrella, April 13, 1916, 1♂, C. H. Lankester, collector. Pacific slope: Alajuela, Rio Brazil in the shade, 3100 ft. (940 m.), September 4, 1909, 1♀. Turrúcares, Rio Siquiares, river bank, 2200 ft. (670 m.), August 13–15, 1909, 2♂, 4♀, P. P. Calvert collector. All the preceding in the writer's collection. Also, Atlantic slope, Tuis, Turrialba, 1000 m. (3280 ft.), 1♂, in 1913 probably collected by O. Garlepp, in the collection of Dr. F. Ris.

Type. Male, Quebrada Honda, August 1, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

Paratypes. All the remaining material cited.

The following description is based on dried specimens only.

♂. Lateral extremities of the transverse occipital carina angulate, but sloping gradually in the two males from Chitaria. Nasus black, a small pale dot each side, or blue with the basal

(posterior) half black (Turrúcares 1♂), or entirely blue (the other ♂ from Turrúcares, Banana River, Estrella), or pale yellow (teneral, Rio Azul).

Pronotum chiefly blue with mid-dorsal black on all three lobes, narrower than the lateral blue on fore lobe, wider than the lateral blue on the mid and hind lobes.

Blue antehumeral stripe narrowed above, varying in width at midheight from .1 to .36 mm. Black humeral stripe at midheight .16 (Banana River)–.55 mm. wide, or in the teneral male from Juan Viñas of August 3, where humeral stripe and mesepimeron form a continuous black band, .74 mm. Mesinfraepisternum black. Black stripe on first lateral thoracic (mesopleural) suture .22–.74 mm. long (except in Juan Viñas, 1♂, Banana River & Estrella, 1.11–1.78 mm.); on second lateral thoracic (metapleural) suture .22–.37 mm. (.52 teneral of Aug. 3) wide at midheight. Stripe on metepimeron much paler than that last mentioned.

Tergites of abdominal segments eight and nine blue, the following black: a small mid-dorsal basal spot and an inferior longitudinal stripe each side for the posterior two-thirds on eight, a similar stripe, but as long as the segment, on nine. One male, Juan Viñas, August 3, has eight black with a pale blue longitudinal stripe each side for the anterior three-fourths of the segment lying just above the normal black stripe, and nine black with an ill-defined paler area each side of dorsum near base; the Estrella male has nine similar and the Banana River male approaches this condition in nine. Tergite of ten black, in some, irrespective of locality, a pale transverse mark on each side of dorsum.

Apex of the wings uncolored or faintly brown. Postnodals: front wings, 19–23 (Juan Viñas & Quebrada Honda), 20–22 (Turrialba), 18–19 (Banana River, Estrella), 19–21 (Turrúcares); hind wings, 18–20 (Quebrada Honda, Juan Viñas, Turrialba), 15–17 (Banana River, Estrella), 17 (Turrúcares). Nodal sector: front wings, arising at eighth or ninth postnodal (Quebrada Honda, Juan Viñas), at seventh or eighth (all others); hind wings, most frequently at the sixth, irrespective of locality, at fifth (Estrella), asymmetrically at fifth, seventh, or eighth in 3 males. Ultranodal sector arising at: ninth to twelfth postnodal, irrespective of locality, front wings; hind wings, at seventh to ninth; or, in cells behind the median vein of de Selys, proximal to the stigma, front wings, 9 to 12 (Quebrada Honda, Juan Viñas, Turrúcares), 8 to 11 (Turrialba), 8 to 9 (Banana River, Estrella); hind wings, 9 to 11 (Quebrada Honda, Juan Viñas, Turrialba), 8 to 10 (Turrúcares), 8 to 9 (Banana River, Estrella). Upper sector of the triangle in all examples ending distad of

the level of origin of the ultranodal by one-half cell to four cells in the area behind the ultranodal (1–6 marginal cells), front wings; by 3 to 6 cells (or 4–11 marginal cells), hind wings. Cells surmounted by the stigma varying from more than one to more than two on both front and hind wings. The Chitaria males have not been included in the statements for the wings.

Superior appendages with the angulation of the inferior margin, where the appendage enlarges, situated at .6–.7 of the appendage-length. Inferior appendages with the basal tooth approximately as long as half the width of the apex of the superiors; apex of the inferiors very similar to that of *paulirica*, but often more robust in dorsal view; there is a slight enlargement on the ventral margin of the mesal surface, distad of the anteapical curvature, not as marked as in *P. nathalia*, but which is apparently absent in *paulirica;* this very slight enlargement in *distadens* is visible in oblique dorso-lateral and meso-ventral views; distad to it the appendage is rapidly contracted (not constricted) to the thin terminal lamella which is shorter than in *paulirica*, but it is difficult to make a measurement which exactly corresponds to that of the latter species.

♀. Differences from the male in addition to those indicated in the key:

Lateral extremities of the transverse occipital carina varying from angulate through subangulate to rounded, irrespective of locality. Nasus pale yellowish, narrowly blackish at base (Juan Viñas, Turrialba), or the brown of the base reaching to the anterior margin but leaving a pale spot each side (Turrúcares, Alajuela).

Blue antehumeral stripe .07–.15 mm. wide at midheight. Blackish or brownish humeral stripe .22–.48 mm. wide at midheight (.52 mm. in a teneral from Juan Viñas in which stripe and mesepimeron are continuously concolorous). Black or brown on the obsolete mesopleural suture .52–1.26 mm. long, or indistinguishable from dark coloring which fills the mesepimeron, on the metapleural suture .22–.67 mm. wide.

Entire wings slightly fumose in 3 females (Juan Viñas, 3400 ft.). Postnodals: front wings, 18–23 (Juan Viñas, Turrialba, Alajuela), 19–20 (Turrúcares); hind wings, 20 (Alajuela), 16–19 (all others). Nodal sector arising at: seventh to ninth postnodal (Juan Viñas, Turrialba, Alajuela), seventh to eighth (Turrúcares) front wings; hind wings, fifth to seventh (Juan Viñas, Alajuela), fifth to sixth (all others). Ultranodal arising: front wings, at eighth to eleventh postnodal; hind wings, at seventh to tenth (irrespective

of locality); or, in cells behind the median vein, proximal to the stigma, front wings, 7–11 (Juan Viñas), 8–10 (all others), hind wings, 8–11 (Juan Viñas, Alajuela, Turrialba), 8–9 (Turrúcares). Upper sector of the triangle ending distad of the level of origin of ultranodal by: front wings, one-third cell to 4 cells in the area behind the ultranodal (one-half cell to 8 marginal cells, Juan Viñas, Turrialba, or $1\frac{1}{2}$ to $4\frac{1}{2}$ marg. cells in the others); hind wings, 2 to 6 cells behind the ultranodal, 3 to 9 marginal cells. Cells surmounted by the stigma varying as stated for the male; taking both sexes together, the most frequent condition is more than two cells on the front wings and less than two cells on the hind.

Dimensions. Abdomen: ♂, 34–42; ♀, 29.5–35.5. Hind wing: ♂, 24–30; ♀, 23–29. Stigma: front wings, costal margin, ♂ ♀, .96–1.33; hind margin, ♂, 1.31–1.55, ♀, 1.26–1.48, distal margin, ♂, .57–.81, ♀, .59–.76, proximal margin, ♂, .59–.96, ♀, .70–.89, all in mm.

The smallest males are those from Banana River and Estrella, the largest the type from Quebrada Honda; the smallest and largest females are from Juan Viñas.

Habitats and Habits. The known vertical range of this species is from sea-level to 1060 m. (3500 ft.) on the Atlantic slope of Costa Rica and on the Pacific slope of the same country from 670 to 940 m. (2200–3100 ft.). The examples collected by the writer were mostly found in woods, more often, but not always, by small streams therein. The males from Quebrada Honda, however, were obtained along a brook descending terraced gardens of manihot, maize, squashes, beets and onions in clearings in forest, where they were associated with the characteristically open stream *Hetaerina cruentata*. *Distadens* was also observed at the "nearer waterfall" at Juan Viñas, August 3, along with *Thaumatoneura inopinata* and *pellucida*[45] and *Argia talamanca*. The association of *distadens* with *Palaemnema paulirica* has already been mentioned on page 34; elsewhere it was observed in company with *Hetaerina sempronia*, *H. miniata*, *H. macropus*, *Cora chirripa*, *C. marina*, *Philogenia carrillica*, *Ph. expansa*, *Heteragrion erythrogastrum*, *Palaemnema reventazoni* and *P. nathalia* and *Argia variabilis*.

Comparison with P. paulirica. In dealing with this species, Dr. Ris remarked: "Unser Expl. hielt ich zunachst für ein

[45] Compare Ent. News, xxv, pp. 337–348, (1914); xxvi, pp. 295–305, (1915).

zweites ♂ der *paulina* forma *c* gleicher Herkunft, dem der schwarze Spitzenfleck der Flügel fehlte. Doch sind die Appendices deutlich verschieden und weicht die Thoraxzeichnung erheblich ab." The possibility of specific identity of what are here called *paulirica* and *distadens* had also occurred to us, especially as Mr. Williamson had shown that males with uncolored wings and males with black-tipped wings may both belong to one and the same species (which he called *paulina*) at El Fiscal, Guatemala. Like Dr. Ris, however, I believe that the appendages of the males furnish sufficient characters for keeping *distadens* and *paulirica* distinct. These are the more distal position of the superior tooth (to which the name *distadens* refers) and the entire, rounded apex of the superiors, as stated in the key, page 25, combined with the shortness of the extreme apex of the inferiors of the former, contrasted with the more proximal superior tooth and slightly excised apex of the superiors and longer terminal lamella of the inferiors of *paulirica*.

In spite of the differences in color of the nasus (postclypeus) and of abdominal segments eight and nine noted above for the males from Turrúcares, Banana River and Estrella, and even one from Juan Viñas, I have been unable to find structural features in the appendages and penis to separate them from the other males here placed under *distadens*. In this connection it is interesting to compare the geographical distribution of the color patterns of the nasus of the two sexes of *distadens* as given above.

Palaemnema paulina (Drury) (Pl. IV, figs. 47A–K, apps. ♂, penis; Pl. XVIII, fig. 73, thoracic pattern.)

1773. *Libellula Paulina* Drury, Illustr. Nat. Hist., II, p. 85 and Index, Pl. 46, fig. 4 [entire insect].

1792. *Libellula paulina* Olivier, Encyc. Meth. Hist. Nat., VII, pt. 2, p. 572, no. 18.

1837. *Lestes paulina* Drury, Illustr. Exot. Ent. New Edition by J. O. Westwood, II, Pl. 46, fig. 4 [same as preceding].

Material examined. HONDURAS: Colorado Division, United Fruit Company Plantations, trail back of Jilamo and El Eden, May 28, 1923, T. H. Hubbell collector, 1♂, Museum of Zoology, University of Michigan.

As has been stated *anteà*, page 4, the type specimen of Drury appears to be lost. His original description reads as follows:

Fig. IV. Expands almost two inches and a half [63 mm.].

The *Head* is black.—The *Eyes* the same, and placed at a distance from each other.—The *Antennae* are very short and thick.—The *Thorax* is grey and striped obliquely on the sides with black.—The *Abdomen* is black, long, and slender; each joint being grey.—The *Legs* are grey, being striped at top with black.—The *Wings* are transparent, except at the tips, where they are of a very dark brown; having a small black spot placed on the anterior edges of each, near their extremities; and which is best observable with a microscope.

I received it from the Bay of Honduras.

I have not seen it anywhere described.

Drury's figure measures 45 mm. total body length, abdomen 36 mm., wingspread 66 mm., hind wing 31 mm.; maximum width of fore and of hind wing each 6 mm. The only pale color shown on the thorax is that of the two complete *blue* antehumeral stripes, which are only a little narrower in their upper, as contrasted with their lower, halves. The remainder of the thorax, including the prothorax (on which no pale spots are shown), is blackish brown; so also is the abdomen, with a paler brown mark at the bases of the posterior nine segments. The proportional lengths of the ten abdominal segments shown are not exact, especially at the two ends of the abdomen.

The venation shown for the four wings differs in some respects. The nodus is shown on the left front wing as considerably nearer to the base (7 mm.) than on the right front (9 mm.). In the postnodal part of three wings, nine longitudinal veins are shown: costal, median, principal, ultranodal, nodal, subnodal, median sector, short and first (upper) sector of the triangle of de Selys, but on the left hind the ultranodal is omitted and the upper sector of the triangle is placed one row of cells posterior to its true position as shown on the other three. The right hind wing is the only one which shows the lower sector of the triangle, but it is quite characteristic and this wing too is fairly accurate for the area between base and nodus, except that it shows three ultraquadrilateral antenodal cells, has the quadrilateral of the same length as each of those three cells, instead of decidedly longer

than any one of them, and its proximal end is shown as oblique, its distal end as right-angled, instead of the reverse. The other three wings have the base to nodus not as well done, the two front wings with too many cross-veins, the left hind with too few, partly on account of the too posterior position of the upper sector of the triangle, as above stated. The postnodals, points of origin of the nodal and of the ultranodal sectors are shown as follows:

Right Front, 18, nodal at 10th,	ultranodal betw. 11th & 12th (7+ cells prox. to stigma)
Left Front, 26, nodal at 16th,	ultranodal at 19th (8 cells, etc.)
Right Hind, 25, nodal betw. 10th & 11th,	" betw. 14th & 15th (12+ cells, etc.)
Left Hind, 21, nodal at 11th,	" omitted.

The "very dark brown" at the tip of each wing begins about one cell proximad to the stigma and extends across the entire width; its proximal edge is shown as shading off gradually into the uncolored part of the wing; its length is about 4 mm. (one-eighth of the wing-length). On the two wings of the right side, the upper sector of the triangle is shown as ending on the hind margin at about one cell proximad of the proximal edge of the brown tip, hence reaching to almost seven-eighths of the wing-length and well distad of the level of origin of the ultranodal by five (front) and seven (hind) marginal cells (which are shown as being larger, instead of smaller, than the cells immediately below the ultranodal). On the two left wings, the upper sector of the triangle is shown as running into the apical brown. The stigma apparently surmounts more than one cell on the right front, more than two cells on left front and left hind, while the number is uncertain on right hind.

In his original preface Drury says (Volume I, pp. xiv–xv): ". . . I laboured under no little trouble from a want of knowing what names to give to many colours found on the wings of some of the farinaceous tribe [Lepidoptera]. The want of a *Series*, or standard for names to colours, is a matter much to be lamented in this kingdom . . . if the reader should chance to meet with any part among them [*i.e.*, his descriptions], that does not entirely correspond with the colour given to the print, he will

impute it to its proper cause, the painter . . . all my descriptions have been taken from the *natural subjects* themselves and not from the *coloured prints* of them."

In Westwood's edition of Drury (where the page is not numbered), the description is repeated in abbreviated form, but with no difference in meaning or interpretation, except that "articulation" is substituted for "joint" in the account of the abdomen. The notes given above on the original figure of 1773 apply to the figure in this edition, except that the marks at the bases of the posterior nine segments are paler, almost a very pale blue.

Much uncertainty attends the determination of what the *paulina* of Drury really is. Eight forms or "species" are described in the present paper, each one of which has some claim to that name. Two of them, here termed *desiderata* and *paulitoyaca*, have already appeared in print as *paulina* Drury. Drury's description has been reprinted verbatim and the detailed account of his figure given here not only for the use of those readers who may not have access to the volume of 1773, but also and chiefly to furnish a means of estimating how much reliance can be placed on the details shown by his "painter" which serve to distinguish our species of *Palaemnema* from each other. Those distinguishing features are given in the preceding key to males by the rubrics beginning with B and ending with DD.

Of all the eight species alluded to above, only two of them have been found in recent years, that is since 1773, on the shores of the "Bay of Honduras," and this fact has had great weight in applying the name *paulina* here. At the same time it must not be forgotten that very little collecting of Odonata has been done on these shores. These two species are represented by the one male here referred to *paulina* and two males and one female here included under *angelina* Selys (*posteà*, page 58). In certain respects, the latter two males agree better with Drury's description and figure than does the single male here considered as *paulina*, namely, in the more nearly uniform width of the pale antehumeral stripes, the length of the hind wing and the greater

extension proximad of the dark brown of the wing tip. The last feature, however, is variable within *angelina* itself and is probably correlated with age after transformation. The identification of *angelina* as such appears, however, to be fairly certain from the drawings of Hagen discussed under that species and, since some objection may be raised to the identification of any and all of the known specimens of the eight species as *paulina* Drury, it seems to the writer best to retain *angelina* Selys in the sense used in this paper and not to synonymize it with *paulina* Drury.

The objections just alluded to which may be raised against identifying any of the known specimens of the eight species as *paulina* Drury are the absence from Drury's description and figure of blue markings from the prothorax and from abdominal segments eight and nine. Any specimen to be identified as *paulina* Drury must have dark brown wing-tips, and all known male specimens with this characteristic have blue markings on the pronotum and the dorsum of eight and nine blue. The identification of any of them as *paulina* Drury must, therefore, assume either (1) that Drury's specimen had completely faded on these parts, or (2) that his painter and Drury himself failed to notice the faded condition. De Selys' identification of what the writer elsewhere and here calls *desiderata* Selys as the true *paulina* Drury implies one or the other of those assumptions. The writer's former identification of what is here called *paulitoyaca* as *paulina* Drury implied the same alternative assumptions and that identification is here rejected because *paulitoyaca* is known only from the State of Vera Cruz, Mexico.

The objections to identifying the Honduran male here referred to *paulina* Drury as that species are the greater width of the blue antehumeral stripe in its lower half, the shorter and narrower wings and the somewhat shorter dark brown apical tip to the wings. The last feature, however, may well be variable, as it is in *angelina* Selys, and the value of the other three objections must remain to be tested by a series of specimens.

A description of this Honduran male now follows:

♂. Lateral extremities of the transverse occipital carina angulate. Nasus pale blue, narrowly black at base.

Pronotum chiefly blue, a median black stripe on mid and hind lobes, narrower than the blue on either side. Propleuron chiefly black.

Blue antehumeral stripe reaching almost to the upper end of the mesepisternum, its upper end .24 mm., its lower end .65 mm. wide. Black humeral stripe .1 mm. wide at midheight, abruptly widened to .74 mm. on the lower end of the mesepimeron. Mesinfraepisternum blackish except at its infero-posterior angle. No black stripe on the obsolete interpleural suture, but the black of the humeral and metapleural sutures connected below the wing-base. Black stripe on the latter .33 mm. wide at midheight.

Tergites of abdominal segments eight and nine pale blue, an inferior black stripe each side for the entire length; ten black.

Apex of the wings brownish from about the distal end of the stigma, proximal edge of the brown not well defined, length about 2 mm. (one-twelfth of the wing-length). Postnodals, front wings, 20 & 21, hind wings, 18. Nodal sector arising: front wings, at eighth postnodal; hind wings, at sixth. Ultranodal sector arising: front wings, at tenth; hind wings, at eighth; or in cells behind the median vein, proximad to the stigma, 10 on all wings. Upper sector of the triangle ending at 3 to more than 4 cells beyond the level of origin of the ultranodal in the area behind the ultranodal (or more than 5–6 marginal cells), front wings, or at 5 cells (7 marginal cells), hind wings. Stigma surmounting 2 to less than 3 cells on the four wings, but asymmetrically.

Superior appendages with the angulation of the inferior margin, where the appendage enlarges, situated at .625 of the appendage-length, the superior tooth at .375 of the same length, the apex very slightly excised and obliquely truncated. Basal tooth of the inferiors one-third as long as the width of the apex of the superiors.

Dimensions. Abdomen, 34. Hind wing, 24. Stigma, costal edge, front wing, 1.23 mm. Maximum width, of front wing 4.8, of hind wing 4.8 mm.

The appendages and the penis of this male are very nearly as in *paulirica* n. sp.

In the *Biologia* volume, page 136 (1903), following de Selys (1886), I referred *Euphaea paulina* Rambur (1842) to *paulina* Drury. On rereading Rambur's description, I believe he had a different insect before him. Contrary to his usual custom, he does not mention the provenance of his specimen and one might at first suppose that he was writing only of Drury's figure, which

he cites. But he says of his example: "l'extremité de l'abdomen manque. . . . Thorax . . . noirâtre, sans tache apparente. . . . Pattes ayant les cils peu nombreux, courts. Ailes transparentes, avec la base des 2e et 3e espaces huméraux d'un jaune roussâtre; premier espace huméral ayant autant de nervules [antenodals] que le radial [postnodals] qui est une exception dans cette famille." All of these expressions indicate that he had an imperfect insect before him and that it was not a *Palaemnema*, or even an Agrionine in de Selys' sense. De Selys' original remark of 1860: that *paulina* Drury "n'a rien de commun avec l'*Euphaea paulina* de Rambur qui cite mal a propos Drury et qui, d'apres le nombre de nervules antécubitales est une Calopterygine inconnue" appears to me to be fully justified.

Hagen's very brief description (1861, p. 72) of *Palaemnema paulina* is evidently a mere summary of Rambur's and, therefore, not that of *paulina* Drury.

Palaemnema paulicoba new species (Pl. V, figs. 48A–G, apps. ♂, penis.)

Material examined. Mexico: Las Tortolas, limestone hills and sink hole valleys north of the railroad station of Cordoba, altitude 800–900 meters (2625–2953 ft.), June 19, 1926, Dr. H. Burrington Baker collector, 1 ♂. This locality, which was Dr. Baker's Station 4, has been described by him at some length.[46]

Type. The above-mentioned male, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

♂. Lateral extremities of the transverse occipital carina angulate but not very prominent. Nasus brown with three pale bluish spots.

Pronotum almost entirely blue, a small black spot, .16 mm. wide, on middle of mid lobe and fine dark lines between lobes. Propleuron blackish.

Blue antehumeral stripe reaching almost the whole length of the mesepisternum, its width, near its upper end, about .3 mm., near its lower end about .8 mm., abruptly narrowed at .32 of its total length from its lower end. Black humeral stripe .08 mm. wide at midheight, abruptly widened to .74 mm. on the lower end of the mesepimeron. Mesinfraepisternum blackish. No

[46] Occas. Papers, Mus. Zool. Univ. Mich., No. 193, pp. 6–8, 9–10, April 2, 1928.

black stripe on the obsolete interpleural suture, but the black of the humeral and metapleural sutures connected below the wing-base. Black stripe on the last-named suture .16 mm. wide at midheight.

Tergites of abdominal segments eight and nine pale blue, an inferior black stripe each side for the entire length of each. Ten black.

Apex of the wings dark brown from the proximal end of the stigma distad, 4 mm. long (one-seventh of wing-length). Postnodals: front wings, 23 & 22; hind wings, 20 & 21. Nodal sector arising: front wings, at the ninth, or between the eighth and ninth postnodals; hind wings, at the seventh, or between the sixth and seventh. Ultranodal sector arising: front wings, at twelfth or eleventh postnodal; hind wings, at ninth postnodal; or in cells behind the median vein, proximad to the stigma, front wings, 9–11, hind wings, 10–11. Upper sector of the triangle ending distad to the level of origin of the ultranodal by 5–6 cells in the area behind the ultranodal (7–9 marginal cells), front wings; or by 7–7½ cells (12 marginal cells), hind wings. Stigma surmounting more than two cells on the right wings, more than three cells on the left; only the right hind wing has a brace vein to the stigma.

Superior appendages with the angulation of the inferior margin, where the appendage enlarges, situated at .53 of the appendage-length, the superior tooth at .42 of the same length, the apex not excised, obliquely truncated. Basal tooth of the inferiors as long as one-half the width of the apex of the superiors.

Dimensions. Abdomen, 38. Hind wing, 27. Stigma: front wings, costal margin 1.06, hind margin 1.64 mm. Maximum width of front wing 5.65, of hind wing 5.56 mm.

Comparisons. *P. paulicoba* (whose name is formed of contractions of *paulina* and Cordoba) has a lateral thoracic color pattern very similar to that of *P. paulitoyaca* in the narrowness of the black stripes on humeral and metapleural sutures, but has the right-angled inferior angle of the humeral stripe of that species rounded off and little trace of a black stripe on the upper end of the interpleural suture;[47] in these latter two respects it resembles *desiderata*. The appendages of *paulicoba* also agree fairly well with the published figure of the appendages of *paulitoyaca*[48] in the position of the superior tooth and angulation of

[47] Compare pl. XVIII, figs. 74, 75, pl. XIX, fig. 81.

[48] Biol. Centr.-Amer., Neur., pl. 5, fig. 40.

the inferior margin of the superiors, and in these two points differ from *desiderata*.

In the position of the superior tooth of the superior appendages, *paulicoba* resembles *P. paulitaba*, but the latter has not the inferior margin angulated. *Paulitaba* has much more black on the sides of the thorax (compare Pl. XIX, fig. 84) and the extreme apex of its inferior appendages is more squarely truncated (*cf.* Pl. V, fig. 48A and Pl. IX, fig. 53J), while in *paulicoba* this is more obliquely truncated, longer and more slender (.078 mm., as compared with .062 mm. in *paulitaba;* Pl. V, fig. 48F and Pl. IX, fig. 53F).

The shape of the superior appendages of *paulicoba* is much like that of the same organs of *P. paulirica*, but the latter species has the terminal lamella of the inferiors much shorter (.03 mm.).

Palaemnema paulitoyaca new species (Pl. V, figs. 49A–G″, apps. ♂, penis; Pl. XVIII, figs. 74–76, thoracic pattern.)

1903. *Palaemnema paulina* Calvert (nec Drury, Rambur, Hagen), Biol. Centr.-Amer., Neur., pp. 134, 136, pl. 5, fig. 40 (apps. ♂). (Atoyac, Vera Cruz, Mexico; 1♂, only.)

1918. *Palaemnema paulina* forma *a* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, p. 93. (Misantla, Vera Cruz, Mexico.)

1903. *Palaemnema angelina* Calvert (nec Selys), Biol. Centr.-Amer., Neur., pp. 134, 136. (Atoyac, Vera Cruz, Mexico; 3♂, 2♀, only.)

1917. *Palaemnema angelina* Kennedy, Ent. News, XXVIII, p. 293, pl. 21, figs. 3, 4 (penis). (Atoyac; 1♂.)

Material examined. MEXICO: Misantla in Vera Cruz, July, 1914, W. Gugelmann collector, 1♂ in coll. Ris (cited by Dr. Ris in his paper of 1918). Atoyac in Vera Cruz, May, 1888, H. H. Smith collector, 1 teneral ♂ in coll. Acad. Nat. Sci. Phila. (cited by Calvert 1903 and Kennedy as *angelina*). The remaining material of *angelina* and the Atoyac male of *paulina* have not been examined by the writer since publishing on them in 1903, but some notes and figures from them were furnished by the late Mr. Herbert Campion and are reproduced here.

Type. The male from Atoyac cited by the writer as *paulina* in 1903, here figured, and now in the British Museum of Natural History.

♂. Lateral extremities of the transverse occipital carina angulate. Nasus (teneral Atoyac ♂) chiefly pale blue, blackish brown at base.

Pronotum blue, a mid-dorsal black line on the fore lobe (Atoyac), a mid-dorsal black stripe on mid and hind lobes wider than the lateral blue except on hind lobe of Misantla ♂. Propleuron dark brown (Atoyac), black, narrowly blue inferiorly (Misantla).

Blue antehumeral stripe complete, narrowing upward, .22 mm. wide at midheight (teneral Atoyac), where it is two to three times as wide as the black humeral stripe (Misantla); in the teneral from Atoyac the humeral stripe is brown and is fused with brown covering the entire mesepimeron, thus forming a band whose width is .67 mm. at midheight. Mesinfraepisternum dark brown (teneral Atoyac) or black, pale at inferior posterior angle (Misantla). No black stripe on the obsolete interpleural suture in the Misantla male or in the type of *paulitoyaca* (see Pl. XIX, fig. 74), but present on the upper half in another male from the same locality previously (1903) referred to *angelina* (see Pl. XIX, fig. 75); in all cases the black of humeral and metapleural sutures are connected below the wing-bases. Black stripe on the last-named suture .26 mm. wide at midheight (teneral Atoyac). In transmitting the drawing for Pl. XIX, fig. 76, Mr. Campion wrote: "I cannot perceive any colour pattern at all on the ventral surface of the thorax of the Atoyac male of *angelina*."

Tergites of abdominal segments eight and nine pale blue, an inferior black stripe each side for the entire length of each; ten black (these segments faded in the teneral Atoyac).

Apex of the wings "without distinct brown markings" in all the examples from Atoyac previously referred to *angelina;* in the type of *paulitoyaca* from the same locality the apical seventh or eighth, in the Misantla male the apical tenth (about 3 mm.) is dark brown. Postnodals: front wings, 21–24; hind wings, 18–22. Nodal sector arising: front wings, at the eighth or ninth postnodal; hind wings, at the sixth or seventh. Ultranodal sector arising: at 9–14 cells proximad to the stigma in the area behind the median vein, front wings; at 8–12 cells, hind wings. Upper sector of the triangle ending beyond the level of the origin of the ultranodal by 4–8 cells in the area behind the latter, all wings. Stigma surmounting: 2–3½ cells, front wings; 2–3 cells, hind wings. (Excepting the postnodals, these data on the venation are those gathered from the four Atoyac males in 1903.)

Superior appendages with the angulation of the inferior margin, where the appendage enlarges, situated at about .6 of the appendage-length, superior tooth at .3 of the same length

(Atoyac),[49] .42 (Misantla), apex of the appendage not excised, obliquely truncated, superior angle rounded off. Inferior appendages with the basal tooth about as long as one-half the width of the apex of the superiors (Misantla), apex with the convex enlargement of the mesal surface, just distad of the anteapical curvature, less marked than in *P. nathalia* and beyond it no constriction, as there is in that species, terminal lamella .08 mm. long (only the teneral Atoyac ♂ has been examined for these details).

Dimensions. Abdomen, 41 (type), 41 (Misantla), 37.5–35 (Atoyac previously referred to *angelina*). Hind wing, 29.5, 30, 24–28 respectively. Stigma: front wing, costal margin 1.1–1.5, hind margin 1.3–1.9 mm.

Comments. In the course of correspondence on the two males from Atoyac in the British Museum, referred to *paulina* and to *angelina* respectively in 1903, the late Mr. Herbert Campion wrote (21 Aug., 1922): "The two males compared are so very much alike that, if they had come to me as undetermined material, I should doubtless have felt strongly disposed to regard the specimen with hyaline wings (*angelina*) as another (possibly immature) form of the one with coloured tips (*paulina*). This view of the case would have found some further support from the fact that both of them had come from the same locality (Atoyac)." In adopting Mr. Campion's view here I have been largely influenced by Mr. Williamson's demonstration that "The apical brown on the wings of males of *paulina* from El Fiscal, Guatemala [*angelina* Selys], is ontogenetic."[50] The case presented by the occurrence of *paulirica* (with brown wing-tips) and of *distadens* (with uncolored wings) in the same locality in Costa Rica is not parallel, since differences in structure are demonstrable, while no such have yet been shown to exist between the two color forms from Atoyac.

Since the females referred to *angelina* in 1903 have not been restudied, nothing can be said of this sex of *paulitoyaca*.

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[49] In 1903 I said of the Atoyac males referred to *angelina* that only one had the appendages present; subsequently these organs of the teneral individual were found and are before me. There is, unquestionably, a difference in the apex of the inferiors of this teneral male (as shown in Plate V, figs. 49A′ and 49G) and of the mature examples in the British Museum according to Mr. Highley's drawings (Plate V, figs. 49G′, G″) which still requires explanation. After viewing the teneral male at various angles, I think it not impossible that the unlikeness is due to dissimilar position. A further examination of the specimens in the Museum will show whether this suggestion is correct.

[50] Proc. U. S. Nat. Mus., XLVIII, p. 612, (1915).

Palaemnema desiderata Selys (Pl. VI, figs. 50A–K′, apps. ♂; Pl. VII, figs. 50L, M, genitalia ♂; Pl. XIX, figs. 78–81, thoracic pattern.)

1886. *Palaemnema desiderata* Selys, Mem. Couron. Acad. roy. Belg., XXXVIII, p. 146. (Mexique. Un male unique. Coll. Selys.)

1903. *Palaemnema desiderata* Calvert, Biol. Centr.-Amer., Neur., pp. 134, 135, pl. 5, fig. 39 (apps. ♂). (Mexico, Presidio in Vera Cruz; 1♂.)

1860. *Palaemnema paulina* Selys (nec Drury), Bull. Acad. roy. Belg., 2me serie, x, p. 434. (Le Mexique, par M. Ghiesbregh; 1♂.)

1886. *Palaemnema paulina* Selys, Mem. Couron. Acad. roy. Belg., XXXVIII, p. 146.

Material examined. MEXICO: 1♂ in Mus. d'Hist. Nat., Brussels, labeled "Mexique Giesbregh," in an unknown hand, and "Palaemnema paulina Dr" in de Selys' hand; this is the specimen cited by de Selys in 1860.[51] Presidio in Vera Cruz, July, Otis W. Barrett collector, in coll. Acad. Nat. Sci. Phila., 1♂, cited by Calvert, 1903. Presidio, 1913, J. W. Gugelmann collector, received in 1920, in coll. F. Ris, 1♂.

As has been already stated, *anteà*, page 51, the type of *desiderata* Selys has been lost and since its provenance was given simply as Mexico, it is still more hopeless to determine its exact habitat than in the case of Ghiesbreght's male. De Selys' colored drawings of it are preserved at the museum at Brussels, dated, in his handwriting, "Liege 14 Janvier 1885," and specify "Mexico" as the locality. The following notes were made from these drawings.

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[51] "Giesbregh" or "Ghiesbregh" is, doubtless, Auguste Boniface Ghiesbreght, born at Brussels, Belgium, March 10, 1810, died February 7, 1893. He was known chiefly as a botanical collector and, according to Rovirosa, was at the port of Vera Cruz and ascended Orizaba in 1838–39, worked actively in Tabasco and in the Sierras de Chiapas 1839–40, "visitó los Estados del Norte y del Sur, cruzó por tres veces la gran Cordillera de Océano á Océano, atravesó la gran Mesa y ascendió á los volcanes de Colima, Jorullo y Cempoaltepec 1840–1855," thence to Tabasco in 1855 and took his collections to Belgium, for the third time, in 1857. In the same year he went again to Teapa, Tabasco, and remained until November, 1862, when he settled at San Cristobal Las Casas, Chiapas, where he was still living at the time of Rovirosa's writing. José N. Rovirosa, "Vida y Trabajos del Naturalista Belga Augusto B. Ghiesbreght, Explorador de Mexico," in La Naturaleza, 2a serie, i, pp. 211–217, Mexico (1887–1890), 1891. The "Vida" is dated at the end Dec. 25, 1888. It is noted by J. D. Smith, Botan. Gaz., XIV, pp. 227–228, 1889. The date of Ghiesbreght's death is given in Botan. Gaz., XVIII, p. 194. Although Rovirosa gives lists of many localities at which Ghiesbreght made collections, it is probably hopeless to expect to learn where he took de Selys' *Palaemnema*. Since that specimen appears to me to be conspecific with Barrett's Presidio male, and the Mexican species of this genus seem to be restricted to small areas, one may conjecture that Ghiesbreght obtained it also in the state of Vera Cruz. Thanks to Dr. H. B. Baker, who went through Presidio in 1910, the locality of Barrett's, and perhaps also of Gugelmann's, males is probably a station on the railroad from Cordoba to Tierra Blanca and Santa Lucrecia, 35 km. from Cordoba and 7 km. from Omealca; Dr. Baker believes it to be "inside the mountains." Compare also Gadow's "Through Southern Mexico" (London & New York, 1908), pp. 74–77, for Presidio.

♂. Pronotum chiefly black, a pair of small blue transverse spots, surrounded on all sides by black, on the hind lobe, a pair of larger blue elongated spots on the mid lobe; fore lobe blue, all its margins narrowly black. Propleuron apparently black (dorsal view only of the prothorax is shown).

Blue antehumeral stripe occupies most of the mesepisternum (except at the upper and lower ends of the sclerite which are black), upper end more pointed than the lower end, at mid-height about one and one-half times as wide as the black humeral stripe. Mesinfraepisternum black, perhaps entirely so. No black stripe is indicated on the obsolete interpleural suture separate from the black of the humeral stripe; perhaps the whole mesepimeron black.

Tergites of abdominal segments eight and nine blue, an inferior, longitudinal, black stripe each side as long as each segment; ten blackish.

Apex of the wings dark brown for 5.3 mm. (terminal .17 of wing-length).

No details of the appendages are given.

Dimensions. Abdomen, 41. Hind wing, 31.7. Stigma, front wing, costal margin, 1 mm.

The following description is based on G(hiesbreght's), B(arrett's) and Gu(gelmann's) males.

♂. Transverse occipital carina apparently absent; nasus shining black, enclosing a small pale blue streak near each lateral end (B, neither of these of features noted for G or Gu).

Pronotum chiefly blue, a transverse black line between fore and mid lobes (B, Gu), a mid-dorsal black stripe on mid and hind lobes which is narrower (G, B) or wider (Gu) than the blue on either side. Propleuron chiefly black.

Blue antehumeral stripe narrowing upward, at midheight .44 (G), .59 (B) mm. wide. Black humeral stripe at midheight .22 mm. wide (G, B), between one-half and one-third as wide as the blue antehumeral (Gu). Mesinfraepisternum black. Black of the humeral and metapleural sutures connected below the base of the wings, not extended forward and downward on the obsolete interpleural suture (G), or at most for .3 mm. thereon (Gu). Black stripe on the metapleural suture .59 mm. wide (B). Metasternum chiefly (B) or entirely (Gu) black, in G mostly destroyed but at least with black stripes reaching as far forward as the third coxae.

Tergites of abdominal segments eight and nine blue (faded in B), with an inferior, longitudinal, black stripe each side as long as the segments; ten black (a small blue spot at base opposite each superior appendage B).

Apex of the wings dark brown for 8 mm. (one-fourth of wing-length). Postnodals: 28, 29 (B), front wings (de Selys says "environ 30" for G); hind wings 26, 25 (B). Nodal sector arising: front wings, at the ninth or tenth postnodal; hind wings, at the seventh. Ultranodal arising: at the 13th (right) or 12th (left) postnodal, front wings; at the 10th postnodal, hind wings; or at 13 (right), 16 (left), front wings, 16, hind wings, cells proximad to the stigma in the area behind the median vein. Upper sector of the triangle ending: at 5–6 cells beyond the level of origin of the ultranodal in the area behind the ultranodal (7 marginal cells), front wings; at 8 (12–13 marginal) cells, respectively, hind wings. Stigma surmounting 4–5 cells (Selys says "quatre" for G), all wings. Only the (B) male has been noted for these details of the venation.

Superior appendages with the inferior margin barely angulated where the appendage enlarges, superior tooth situated at .24 (B), .29 (G), or .36 (Gu) of the appendage-length, apex of the appendage barely excised. Inferior appendages with the basal tooth about half as long as the width of the apex of the superiors; apex resembling that of *P. paulitoyaca* and of *P. nathalia* in the relatively great length of the terminal lamella, but this lamella is not as closely bent toward the proximal part of the tip as in those two species, for in them, in postero-supero-internal view, the interval between the lamella and the adjacent proximal part is subparallel-sided and its width is subequal to the thickness of the lamella, while in *desiderata* this interval's sides are strongly divergent distad and its extreme width is almost twice that of the lamella. As in *paulitoyaca* and *nathalia*, *desiderata* has a distinct convexity *v* on the mesal surface just distad of the ante-apical curvature; as in *nathalia*, but not in *paulitoyaca*, there is a slight constriction just distad of this convexity and just proximad to the terminal lamella. (Compare Pl. V, fig. 49G; VI, fig. 50G; XV, fig. 64G.) *

♀. Unknown.

Dimensions. ♂. Abdomen: 42 (G), 44 (B, Gu). Hind wing: 30 (G), 31 (B), 33 (Gu). Stigma: front wing, costal margin, 1.38 (G), 1.55 (B), 1.25 (Gu) mm. Maximum width of front wing, (B) 6.87; of hind wing, (B) 6.71 mm.

* Among Hagen's drawings preserved at the Museum of Comparative Zoology, Cambridge, Massachusetts, are two labeled "1. Palaemna Paulina" in Hagen's hand. Mr. Samuel Henshaw kindly permitted me to reproduce enlarged copies of them here as figs. 50A, B, Pl. VI. Presumably they were made from Ghiesbreght's male for the never-published "Monog. Agrion." to which Hagen alludes at the top of page 72 of his *Synopsis of the Neuroptera of North America*, 1861. They are interesting for comparison with the figures by M. Biesemen (50A′, B′) from the same specimen.

Comments. The identification of the (G) and (B) males as *desiderata* is the same as that adopted by me in 1903; at that time (Gu) did not exist and I had not made the study of (G) which has confirmed me in my previous opinion that it is conspecific with (B). G is the male which de Selys in 1860 and 1886 identified as *paulina* Drury. To that identification I objected in 1903, as I do now, on the ground that G and B have the terminal *fourth* of the wings dark brown, while Drury shows only the terminal *eighth* so colored. To this may be added that, assuming that Drury's locality is correct, we know no *Palaemnema* with such heavily colored wings from the Bay of Honduras.

It is another question whether it is correct to identify these three males as *desiderata* Selys. De Selys compared his single specimen with this very (G) male in drawing up his description of *desiderata*, and in doing so wrote of the latter as "Extrêmement voisine de la *paulina*, dont elle n'est probablement qu'une race, peut-être même une variété individuelle. Elle en diffère par ce qui suit: 1. Ailes plus étroites; 2. Quadrilatère plus court, le côté externe plus oblique; 3. Le secteur nodal commence entre le nodus et le ptérostigma (plus près du nodus chez la *paulina*); 4. Ptérostigma plus carré, surtout en dehors (chez la *paulina* le côté externe est arrondi, et l'interne plus oblique); 5. La partie opaque des ailes moins étendue, n'occupant que leur cinquième (le quart chez la *paulina*); 6. Le lobe postérieur du prothorax bleu, traversé et bordé de noir (chez la *paulina* le bleu n'occupe que les deux extrémités latérales); 7. Au thorax, la bande antéhumerale bleue, est plus large."

Number 5 of these differences is remarkable, seeing that the difference in the extent of the "opaque part of the wing" between Drury's figure of his *paulina* and the (G) male, which de Selys referred to that species, is so much greater than the difference given by de Selys between *paulina* and *desiderata*. It arouses the suspicion that de Selys himself never saw Drury's figure, but obtained his information of it through an intermediate source. No. 3 is presumably to be interpreted as meaning that the nodal sector arises at about the fifteenth postnodal; none of the males of *Palaemnema* having dark brown wing tips, with which I am acquainted, have the origin of the nodal sector shifted so far

distad as to lie at about the middle postnodal and this would appear to be the strongest differential of *desiderata*, if the latter be not, as de Selys suggested, an individual variation. No. 6 is elucidated by the descriptions of the pronotum given above. De Selys' colored drawings of *desiderata* are hardly exact enough to enable one to translate differences Nos. 1, 2, 4 and 7 into numerical values, and the determination of their constancy must await an examination of a series of specimens, one of which possesses de Selys' seven distinctive features of the lost type of *desiderata* and all of them preferably from the same locality.

The Brussels Museum possesses also de Selys' colored drawings of his *paulina*, dated in his handwriting, "Halloy 6 8bre 1884"; they agree, as far they go, with the notes published above made from male G.

Palaemnema paulicaxa new species (Pl. VII, figs. 51A–G′, apps. ♂, penis; Pl. XVIII, fig. 77, thoracic pattern.)

Material examined. Mexico: near Necaxa, State of Puebla, 925 m. (3035 ft.), July 8, 1926, Dr. H. Burrington Baker collector, 1♂. Dr. Baker states that Necaxa is on the Rio Necaxa, a branch of the Rio Tecolutla, and is about 15 km. east of Beristain (N. Lat. 20° 11′, W. Long. 98°).

Type. The same male, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

♂. Lateral extremities of the transverse occipital carina rounded. Nasus black and brown, each lateral fourth blue.

Pronotum: fore lobe blue, slightly brownish in the middle; mid and hind lobes chiefly black, each with a rounded blue spot each side, one-half as wide as the mid-dorsal black. Propleuron black, inferior margin narrowly yellowish.

Blue antehumeral stripe .5 mm. wide at its lower end, narrowing upward, ending at .7 of the height of the sclerite, above which it is continued by small, isolated, blue spots; at midheight of the mesepisternum it is one-third as wide as the black which covers the entire mesepimeron and which is fused with the black humeral stripe and is 1.0 mm. wide at midheight of the latter sclerite. Mesinfraepisternum black, inferior margin pale yellowish. Metepimeron, above the latero-ventral carina, with a longitudinal blackish-brown stripe which, instead of crossing the carina, is directed slightly dorsad and connected with the rather broad blackish stripe on the metapleural suture. There

is also a blackish stripe on each side of the metasternum, subparallel to the same carina, but not attaining the third coxae by 1.6 mm.

Tergites of abdominal segments eight to ten blue, an inferior, longitudinal, black stripe each side, as long as each segment.

Apex of the wings dark brown for 9 mm., front wings (.27 of the wing-length), 10 mm., hind wings (.3 of the wing-length), the brown beginning 5 (front wings) or 6 (hind wings) mm. proximad of the stigma. Postnodals: 28, 26, front wings; 25, 24, hind wings. Nodal sector arising: front wings, at the ninth postnodal; hind wings, at the seventh. Ultranodal sector arising at: the eleventh postnodal, front wings; eighth, hind wings; or, in cells behind the median vein, proximad to the stigma, 14 front wings, 15 or 16 hind wings. Upper sector of the triangle ending: at $4\frac{1}{2}$ to $5\frac{1}{2}$ cells beyond the level of origin of the ultranodal (6 marginal cells), front wings; at 7 or 9 (10 or 12 marginal) cells, hind wings. Stigma surmounting more than three or more than four cells, front wings, three or more than three, hind wings.

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth situated at .6 of the appendage-length, apex of the appendage not excised, squarely truncate, angles rounded off. Basal tooth of the inferiors, best seen in profile view, as long as one-third of the width of the apex of the superiors.

♀. Unknown.

Dimensions of the ♂. Abdomen, 45 mm. Hind wing, 33 mm. Stigma: front wing, costal margin 1.47; hind margin 1.96 mm. Maximum width of front wing, also of hind wing, 6.87 mm.

Habitat. Dr. Baker states that this male was taken in the shade of second growth (subtropical) along a series of cascades made by a brook near Necaxa.[52]

Comparisons. This type approaches the B male of *desiderata* in the rear view of the apex of the inferior appendages, but differs in having a shorter basal tooth on the inferiors, the superiors with the superior tooth more distal and more acute, the apex (in supero-internal view) less obliquely truncate and in the tips of the penis filaments. In these differentials from *desiderata*, *paulicaxa* is much nearer to *paulitaba*. *Paulicaxa* is like *paulicoba* in having the penis tips of the form *b*, but differs therefrom by the same appendage characters as distinguish it from *desiderata*, while in addition it has the apex of the inferior appendages less attenuate in rear view; all these characters are also different from those of *paulirica*.

[52] He has given a detailed description of the region in Occas. Papers, Mus. Zool. Univ. Mich., No. 193, pp. 14–18, (April 2, 1928).

Palaemnema paulitaba new species (Pl. VIII, figs. 53D–E, penis; Pl. IX, figs. 53A–C, F–J, apps. ♂; Pl. XIX, figs. 82, 84, thoracic pattern.)

Material examined. MEXICO: Tabasco, July, J. W. Gugelmann collector, 4♂, 2♀; without data (Tabasco?), same collector, 2♂, 1920, all in coll. Ris.

Type. One of the males from Tabasco, here figured, given to the author and to be deposited in the Academy of Natural Sciences of Philadelphia.

Paratypes. The remaining specimens from Tabasco.

♂. Transverse occipital carina feebly developed, its lateral extremities rounded. Nasus chiefly blue, a narrow black stripe at base.

Pronotum with a mid-dorsal black stripe on all three lobes, which is narrower than the lateral blue or yellow of either side on the fore lobe, but twice as wide as the lateral blue of either side on mid and hind lobes; a transverse black line between lobes. Propleuron black, pale inferiorly in some.

Blue antehumeral stripe reaching upward only .6 of the way to the wing-base, narrowing upward to a blunt point; at one-half of the height of the humeral suture it is twice as wide as the black humeral, except in the two males without data, where the latter is reduced to a mere line. Mesinfraepisternum black. Black on the obsolete interpleural suture variable: an isolated, elongated spot 2 mm. long and .5 mm. wide; or this spot narrowly connected with the narrow black line which joins the black of the humeral and metapleural sutures just below the wing-base; or this spot is connected as above and also at the middle of its length or elsewhere with the black humeral stripe. Metepimeron with an isolated, longitudinal, black stripe, dorsal to the latero-ventral carina, and another on the metasternum reaching from the angulation of this carina nearly half-way to the third coxa.

Tergites of abdominal segments eight to ten blue, each with an inferior, longitudinal, black stripe each side for the entire length.

Apex of the wings dark brown for 6–4 mm. (distal fifth or sixth). Postnodals: front wings, 27, 26; hind wings, 25, 24. Nodal sector arising: front wings, at the ninth postnodal; hind wings, at the eighth or seventh. Ultranodal arising at: front wings, the eleventh postnodal; hind wings, the tenth or ninth; or in cells behind the median vein, proximad to the stigma, 13 front wings, 13 or 14 hind wings. Upper sector of the triangle ending beyond the level of origin of the ultranodal by: front wings, 2–3½ cells in the area behind the ultranodal (3 or 5½ marginal cells); hind wings, 4½ (5 or 5½ marginal) cells. Stigma surmounting more than three cells on all wings.

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth situated at .35–.47 of the appendage-length, apex of the appendage not excised. Basal tooth of the inferiors about as long as one-third of the width of the apex of the superiors.

♀. (Probably not entirely mature.) Differs from the male as follows: Nasus black, a small yellow spot at each lateral end.

Pronotum: fore lobe entirely pale yellow, mid-dorsal dark stripe on mid and hind lobes subequal to the pale lateral (blue?) of either side. Propleuron dark brown.

Blue antehumeral stripe reaching upward to .6 (in 1 ♀), to .4 (in the other ♀) of the way to the wing-base. A dark humeral stripe present but ill-defined, an apparently isolated, ill-defined pale spot at the upper end of the humeral suture. Mesinfraepisternum pale, darker inferiorly. Black on the obsolete interpleural suture absent (1 ♀) or small and obscure (1 ♀). Metepimeral stripe indicated in both ♀, the metasternal in 1 ♀ only.

Abdominal segments eight and nine as stated in the key, *antea*, page 28 "S"; ten as in the ♂.

Apex of the wings dark brown for 1.0–2.0 mm. (distal 1/26–1/13 of wing-length). Postnodals: front wings, 23; hind wings, 22, 21. Nodal sector arising at the seventh postnodal, hind wings. Ultranodal arising at 10 (front wings) or 12 and 10 (hind wings) cells proximad to the stigma, etc. Upper sector of the triangle ending beyond the level of origin of the ultranodal by $2\frac{1}{2}$ cells (3–4 marginal cells), front wings; by 5 (6 marginal) cells, etc., hind wings. Stigma surmounting less than three cells on all wings.

Dimensions. Abdomen: ♂, 34–40 (33–42, "without data"); ♀, 31–32. Hind wing: ♂, 25–30 (23.5–28 w. d.); ♀, 25–25.5. Stigma: front wing, costal margin, ♂, 1.06 (1.0 w. d.); ♀, 1.0 mm. Maximum width of front wing, ♂, 4.75, of hind wing, ♂, 4.66 mm.

The data given in the above description on the occipital carina, nasus and venation are taken from a single (the type) male and a single female only.

The specific name here proposed is compounded of parts of "paulina" and of "Tabasco."

Some comparisons of *paulitaba* with other species are given at the end of the article on *P. paulicaxa*.

Palaemnema angelina Selys (Pl. VIII, figs. 52A–J, apps. ♂, penis; Pl. XIX, fig. 83, thoracic pattern.)

1860. *Palaemnema angelina* Selys, Bull. Acad. roy. Belg., (2), x, p. 435. (Guatemala, ♂; Museum de Paris.)

1886. *Palaemnema angelina* Selys, Mem. couron. Acad. roy. Belg., XXXVIII, p. 147. (Honduras; 1♂.)

1915. *Palaemnema paulina* Williamson, Proc. U. S. Nat. Mus., XLVIII, p. 608, pl. 40, figs. 1–3 (wings). (El Fiscal, Guatemala; 27♂, 2♀.)

1917. *Palaemnema paulina* Kennedy, Ent. News, XXVIII, pp. 291, 293, pl. 21, figs. 1, 2 (penis). (El Fiscal, Guatemala.)

1918. *Palaemnema paulina* forma *b* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, p. 93, fig. 48 (apps. ♂). (El Fiscal, Guatemala; 1♂.)

Material examined. GUATEMALA: El Fiscal in Dept. Guatemala, June 3–6, 1909, E. B. Williamson collector, 16♂, 3♀, in colls. Williamson, Calvert, Ris. HONDURAS: Dakota, May 27, 1923, 2♂, and Colorado Division, United Fruit Company Plantations, trail back of Jilama and El Eden, May 28, 1923, 1♀, T. H. Hubbell collector, in coll. Mus. Zool. Univ. Mich.

As stated *anteà*, pages 4–5, the type of de Selys from Guatemala and his male from Honduras are apparently lost. In them the tips of the wings were not more than "très-légèrement salies après le ptérostigma." In the Museum of Comparative Zoology, Cambridge, Massachusetts, are preserved two drawings by Dr. H. A. Hagen, labeled in his handwriting, "2. Palaemnema angelina d. Selys." They show dorsal and left profile views of the male appendages and in view of the close cooperation which existed between Hagen and de Selys, especially from 1843 to 1867, it is likely that these drawings were made from the type from Guatemala. They are reproduced here as our figures 52A and 52B, Plate VIII. They appear to agree well with the males from El Fiscal, and as Mr. Williamson showed in his description of 1915 that his specimens varied from having the apex of the wings without trace of dark color to one with the tip black from the level of the stigma, while in the male appendages there seemed "to be no noteworthy variation," there is no apparent objection to regarding all the literature above cited as referring to one and the same species.

De Selys' colored drawings of *angelina*, preserved in the Brussels Museum, were dated by him "Halloy 6 oct. 1884"; the locality of the specimen drawn is not given. The date might

suggest that it was the Honduran male. Perhaps fuller notes than those which I made of the drawings might be decisive; these notes follow:

♂. Pronotum: fore lobe all blue; mid and hind lobes with a mid-dorsal black stripe which is wider than the blue on either side thereof; a fine black line between each lobe and the next. Propleuron black (only a dorsal view is shown).

Blue antehumeral stripe occupying the entire length of the mesepisternum and of uniform width throughout; at midheight about one-third as wide as the black humeral stripe. No black stripe separate from the humeral stripe is shown on the interpleural suture, but I was unable to decide whether it was intended to show the *entire* mesepimeron as black or not. Mesinfraepisternum black.

Tergites of abdominal segments eight and nine very pale blue, an inferior, longitudinal, yellowish stripe (obscure on nine) for the entire length of each segment; ten blackish brown, paler inferiorly each side.

Apex of the wings ochre-brown in the area between the costa and the median vein from stigma to wing-tip, and in the area between the median vein and principal sector from the third cell beyond the stigma to wing-tip, but not elsewhere.

No details of the appendages shown.

Dimensions. Abdomen, 41 (full length of wing not shown). Stigma, front wing, costal edge about 1.17 mm.

The following description is based on the material above listed as examined and gives only data additional to, or different from, the description made from de Selys' drawings.

♂. Lateral extremities of the transverse occipital carina angulate (El Fiscal), less so in the two males from Honduras. Nasus pale bluish, narrowly blackish-brown along base, darkening all over through brown to black with age.

Fore pronotal lobe narrowly black on the mid-dorsal line.

Blue antehumeral stripe narrowing upward, .33–.2 mm. wide at midheight, 1.7–1.4 times as wide as the black humeral at this level when the latter is distinct from any obscure coloring of the mesepimeron. Dark colors of the humeral and metapleural sutures connected narrowly below the wing-bases and sending a pointed extension ventrad on the upper end of the obsolete interpleural suture. Black stripe on metapleural suture .16–.52 mm. wide at midheight. A brown or black longitudinal stripe on the metepimeron continued over the latero-ventral carina cephalad on to the metasternum, almost to its anterior end.

Tergites of eight and nine with the inferior longitudinal stripe blackish, but for only the posterior two-thirds of eight; a blue spot on each side of ten in at least some males.

Apex of the wings varying ontogenetically from uncolored to black from the level of the stigma (El Fiscal, *teste Williamson*), uncolored or very faintly brownish at the extreme apex (Honduras 2♂). Postnodals: front wings, 21–28 (24 most frequently, 35%); hind wings, 18–23 (21 most frequently, 35%) (El Fiscal, *teste Willmsn.*); 22–24 front wings, 19–20 hind wings (Honduras 2♂). Nodal sector arising: front wings, at the seventh or eighth postnodal (Hond.), eighth or more remote (El Fiscal); hind wings, at the fifth to the seventh (Hond.), sixth or more remote (El Fiscal). Upper sector of the triangle ending distad to the level of origin of the ultranodal by: 2–9 marginal cells, front wings; 7–13 marginal cells, hind wings (El Fiscal, *teste Willmsn.*). Cells surmounted by the stigma: front wings, 2 to more than 3; hind wings, 2–3 (El Fiscal, *teste Willmsn.*); 2 to more than 3 front wings, 3 to less than 3 hind wings (Hond. 2♂).

Superior appendages with the inferior margin barely angulated where the appendage enlarges, superior tooth situated at .31–.38 of the appendage-length, apex of the appendage deeply excised at 90°, the superior margin prolonged as a distinct process overhanging the excision. Inferior appendages with the basal tooth subequal in length to the width of the apical excision of the superiors; apex of the appendage bent mesad on itself to form a hook whose extremity is lamellate (Pl. VIII, figs. 52F, G, *s*), directed chiefly cephalad and truncated; the inferior margin forms an angular tooth (*t*) at the place where the apical hook begins; this tooth is short but acute in a posterior view (fig. 52F); in this view, and especially in a similar, but more superior view, another, but more acute, tooth or spine (*v*) is visible on the mesal surface of the appendage proximad to the apical hook; this spine *v* is the dorsal edge of another lamella which projects mesad and caudad from the appendage-surface, as may be well seen in an antero-ventral view.

♀. Differences from the male in addition to those indicated in the key, pp. 28–29.

Nasus: none of the four specimens show the nasus entirely brown or black; all have at least the lateral ends pale bluish. Fore pronotal lobe with the black of smaller extent. Blue antehumeral stripe at midheight equal to, or narrower than, the black humeral.

Apex of the wings uncolored. Postnodals: front wings, 22–24; hind wings, 20–21 (El Fiscal), 19–20 and 18 (Hond.). Cells

surmounted by the stigma: front wings, 2–3, hind wings, 2 (El Fiscal); less than 3 and 3 or less than 3 (Hond.) (the El Fiscal data, *teste Willmsn.*).

Dimensions. Abdomen: ♂, 37.5–43.5; ♀, 34–35.5. Hind wing: ♂, 27–32; ♀, 27–29. Stigma: front wings, costal margin, ♂, 1.23–1.33, ♀, 1.23; hind margin, ♂♀, 1.47. Maximum width of front wing, ♂, 5.56; of hind wing, ♂, 5.65 mm. (El Fiscal). Corresponding values for the Honduran specimens are: ♂, 33–35, ♀, 30; hind wings, ♂, 24–24.5, ♀, 24; stigma, costal margin, ♂, 1.18–1.23, ♀, 1.39, ♂, 4.75, ♂, 4.66 mm.

Habitats and Habits. El Fiscal, Guatemala, is at an elevation of about 3700 feet (1128 meters).[52a] Mr. Williamson describes[53] the locality there, at which he took these specimens, as a deep ravine, whose sides, in places, "were perpendicular or even overhanging. . . . At places the sides rose less abruptly and agaves were very numerous. At several points there were boggy spots on the sides of the ravine, about which grew some of the arums with other lush vegetation. *Hetaerina capitalis* was common in this ravine. The Palaemnemas occurred especially about the boggy spots, resting on larger leaved plants near the ground, and flying low and through brush to escape." On the other hand, the localities in Honduras at which Mr. Hubbell made his captures are at but slight elevations above sea-level and not far from the coast; he noted that the two males were taken in "humid forest."

Palaemnema domina Calvert (Pl. VIII, figs. 54A, apps. ♂; Pl. XIX, fig. 85, thoracic pattern.)

1903. *Palaemnema domina* Calvert, Biol. Centr.-Amer., Neur., pp. 134, 137, pl. 5, fig. 42 (apps. ♂). (Isthmus of Tehuantepec, Mexico; 1♂, 1♀.)

Material examined. Only the type male and the paratype female are known; they are in the Museum of Comparative Zoology, Cambridge, Massachusetts. They have not been examined by the writer since the very brief original description was published. As stated therein, they are apparently teneral and the appendages of the male were accidentally destroyed after the figure and description were made. Mr. Nathan Banks has kindly furnished some notes upon them and a figure of the color pattern has been drawn under his direction and reproduced here as Plate XIX, figure 85.

[52a] Williamson, Occas. Papers, Mus. Zool. Univ. Mich., no. 130, p. 31, (1923).

[53] Proc. U. S. Nat. Mus., XLVIII, p. 609, (1915).

Mr. Banks' notes follow, with my comments enclosed in square brackets [ ]: "The dark on the pronotum is not very plain, not near as dark as on the mesonotum. There is a dark ridge across the anterior lobe and each of the lateral lobes [mid lobe] is dark across the top. The posterior lobe is very largely dark but the lower posterior side is pale. On one side this is very plain, on the other indistinct [in my original description I have 'Hind lobe of prothorax entirely blue, without black markings']. The lower lateral lobe [propleuron] has a dark spot not clearly margined but fading out and may have covered more than I indicated, but the coloring of the prothorax is so faded and somewhat discolored that I cannot be sure of some of the details.

"The dark on the lower part of the thorax (metathorax) is rather faint, but on one side I can make out the border fairly distinctly. I doubt if this dark was ever black but rather a light brown. It may be that the dark spot on the posterior part of the metapleura connects with the mark in front, but there is a large crack in the skin at this place and it is difficult to be sure of it. On the other side this area is crumpled and shrunken and also cracked so that I cannot see near as much. The lower posterior part of the dark on the metapleura is quite definitely limited and I have indicated it on the drawing" [Pl. XIX, fig. 85].

The remainder of this description is based on my original notes of 1903.

Wings of both sexes without distinct brown markings. Postnodals: front wings, ♂, 21, 20, ♀, 18; hind wings, ♂, 18, ♀, 17. Nodal sector: front wings, arising at the eighth or seventh postnodal, ♂, at the eighth, ♀; hind wings, ♂ ♀, at the sixth. Ultranodal arising at 8 (right), 10 (left), ♂, front wings, cells proximad to the stigma behind the median vein, 8 (right), 7 (left), ♀; hind wings, at 10 (right), 9 (left), ♂, 9, ♀ cells, etc. Upper sector of the triangle ending beyond the level of origin of the ultranodal by 4, ♂, 6 (right), 4 (left), ♀, cells behind the ultranodal, front wings; by 8 (right), 7 (left), ♂, 7, ♀ cells, hind wings. Cells surmounted by the stigma: front wings, 2 (right), 3 (left), ♂, 2, ♀; hind wings, 2, ♂, more than 2, ♀. The right hind wing of the female is lost.

Superior appendages of the male having the inferior margin not distinctly angulate where the appendage enlarges to form the apical *half*, the widening being gradual; an obtuse tooth-like projection on the superior surface at almost .5 of the

appendage-length, there being consequently no sinus or notch visible between this projection and the widening of the inferior margin when the appendage is viewed from above.

Dimensions. Abdomen: ♂ ♀, incomplete. Hind wing: ♂, 23, ♀, 24. Stigma: front wing, costal margin, ♂, 1.1, ♀, 1.0; hind margin, ♂, 1.3, ♀, 1.4 mm.

Habitat. The two known specimens are labeled "Isthmus of Tehuantepec F. Sumichrast," without particular locality or date. Presumably they were collected at the same time as his birds, September, 1868, to September, 1872, listed by Lawrence (Bull. U. S. Nat. Mus., no. 4, 1876, where some eighteen localities, chiefly on the western side of the Isthmus, are mentioned). Gadow says (Proc. Zool. Soc. London, 1905, ii, p. 197) of the Isthmus: "Eastern slope, dense humid evergreen forest; on the ridge, less than 1000′, open country with temporary stagnant lagoons; on the western slope prevails the dry Pacific type without continuous forests, but with more scattered patches of mostly deciduous trees."[54] Additional material from this region is evidently necessary to establish the status of this species.

Palaemnema mutans new species (Pl. II, figs. 37–39, rear of head, prothorax ♀; Pl. III, figs. 44, 45, antennae; Pl. IX, figs. 55A–G, apps. ♂, penis; Pl. XX, fig. 86, thoracic pattern.)

Material examined. VENEZUELA: La Fria, 460 feet (140 meters), April 12–18, 1920, 24♂, 3♀; Tachira, 1200 feet (366 meters), 60♂, 7♀; April 4–10, 1920, all collected by J. H. and E. B. Williamson and W. H. Ditzler, in coll. E. B. Williamson.

Type. Male, La Fria, April 12, 1920, here figured.

Paratypes. All the other specimens above listed.

The following description is based on the dried specimens.

♂. Lateral extremities of the transverse occipital carina rounded. Nasus entirely shining black, occasionally a suggestion of a paler area each side.

Pronotum obscure, but some show a blue spot on each side of fore and of mid lobes. Propleuron blackish.

Blue antehumeral stripe very short, .16–.5 mm. long, immediately behind the anterior mesothoracic margin, dorsal thoracic surface otherwise violaceous brown to the interpleural suture. Mesinfraepisternum black, inferior margin pale.

[54] A much fuller description is given in his "Through Southern Mexico" (London & New York, 1908), chapters vii–ix.

Tergite of abdominal segment eight blue in the posterior one-fourth to three-fourths, remainder black with a transverse, basal, mid-dorsally interrupted, yellow ring, and the usual inferior, longitudinal, black stripe each side for almost the entire length of the segment except at the basal ring, which latter is frequently reduced to an inferior yellow spot each side; the basal mid-dorsal black is often not confluent with the inferior black stripe. Segments nine and ten blue dorsally, nine with a longitudinal, inferior, black stripe each side for its entire length and a transverse, black stripe on its basal ninth or less.

Apex of the wings uncolored. Postnodals: front wings, 17–20 (19 most frequent); hind wings, 16–20 (17 and 18 equally frequent). Nodal sector arising: front wings, at the sixth to the eighth postnodal (seventh); hind wings, at fifth to seventh (sixth). Ultranodal arising: front wings, at seventh to ninth postnodal (eighth); hind wing, at sixth to eighth (eighth); or, front wings, at 9–12 (11) cells proximad to the stigma, behind the median vein; hind wings, at 8–12 (11) cells, etc. Upper sector of the triangle ending beyond the level of origin of the ultranodal in 80% front wings, ♂ ♀, by less than 1 to 3 cells in the area behind the ultranodal (1–4 marginal cells), and in 98% hind wings, ♂ ♀, by 3 to more than 5 cells (3½–8 marginal cells); 16% front wings, ♂ ♀, have this ending at that level, 1 wing (2%) proximad to that level. Cells surmounted by the stigma: front wings, more than one to more than two (2); hind wings, more than one to two (2). Stigma, examined in strong sunlight, of a rich reddish brown (near "dragons blood" of Smith's *Glossary of Entomology*).

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth situated at mid-length of the appendage, tip of tooth subobtuse; apex of appendage excised at 90°, the superior margin projecting beyond the level of the inferior margin by about as much as the length of the other margin of the excision. Inferior appendages with the basal tooth directed dorsad and caudad, shorter than the overhanging process at the apex of the superiors; the degree of curvature shown by the apex of the appendage varies as seen in posterior view (compare Pl. IX, figs. 55F–F''''). Of thirty-four males especially examined for this point, twenty-one, including the type, have a small tooth, varying in size, near the tip of one or of both inferiors; on the other hand thirteen males have no such tooth; no correlation of the presence or absence of this tooth with one or other of the two localities exists.

♀. Differences from the male in addition to those indicated in the key, pages 28–29: Blue antehumeral stripe, when present, .33 mm. long. Postnodals: front wings, 17–19 (18 most fre-

quent); hind wings, 16–18 (18). Ultranodal arising: front wings, at the eighth or ninth postnodal (eighth); hind wings, at the seventh or eighth (seventh); or, front wings, at 8–11 (10) cells proximad to the stigma, behind the median vein; hind wings, at 8–11 (10) cells, etc. Cells surmounted by the stigma, front wings, two or less than two equally frequent; hind wings, one, less than two and two, the last most frequent.

Dimensions. Abdomen: ♂, 34–41; ♀, 28–34. Hind wing: ♂, 21.5–27; ♀, 22–25.5. Stigma: front wings, costal margin, ♂ ♀, .98–1.14 mm.

Habitats and Habits. Mr. Williamson has given descriptions[55] of the two localities, La Fria and Tachira, at which this species was taken. Both lie in the western part of Venezuela, to the southwest of Lake Maracaibo, and at both *Palaemnema clementia* also was collected. Doubtless some of the species of *Hetaerina* which he found there were closely associated with the two *Palaemnemae.*

Food. Dried excrement protruding from the anus of five specimens (3♂, 1♀, Tachira, April 6, 8, 9, 1♂, La Fria, April 16) was soaked in distilled water, teased and examined under the compound microscope (Zeiss oc. 3, obj. DD) both before and after dehydration, clearing and mounting in balsam. Each sample contained large numbers of small chitinous pieces, spines, hairs, antennal joints, bits of legs and fragments of compound eyes of 3–24 facets. The last were of both circular and hexagonal shape. The diameter of the circular facets varied from .006 to .024 mm., the (diagonal) diameter of the hexagonal facets from .016 to .026 mm. In one sample, a fragment of a sporangium of a fern was present, consisting of an arc (of nearly 180°) of an annulus (greatest length .28 mm.) and a small part of the side wall; did this pass through the alimentary canal, or did it become attached to the excrement when the latter was freshly extruded?

Note on Venational Variations. The data on venation given in this description are based on a tabulation of fifteen males, ten females—all of the latter sex that are available. Of the fifteen males used, six are from La Fria, nine from Tachira; these small numbers indicate that the most frequent number of postnodals at La Fria is 18, front wings, and 17, hind wings, while the corresponding numbers for Tachira are 19 and 18. This

[55] Occas. Papers, Mus. Zool. Univ. Mich., no. 130, pp. 33, 43, (1923).

species would therefore appear to be one of those like *Ischnura ramburi* in Central America and *I. denticollis* in Mexico,[56] in which the number of postnodals tends to increase with altitude. An examination of larger numbers of individuals of *Palaemnema mutans*, however, diminishes the differences between the examples from the two localities, as follows:

Length of Hind Wing in Millimeters

	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5
La Fria, 24♂...	4	0	4	4	4	21	21	25	12	4			%
Tachira, 58♂...		1.7	1.7	3.4	5	10.3	13.7	34.5	8.6	12	6.9	0	1.7%

	Postnodals, Front Wing						*Postnodals, Hind Wing*					
	16	17	18	19	20	21	15	16	17	18	19	20
La Fria, 24♂...		8	42	35.5	12	2%		6	42	39.5	12	%
Tachira, 58♂...	1	10	41	39	9	%	1	10	37	41	8	1.8%

It should be observed that the difference in elevation between La Fria and Tachira is but 740 feet (225 meters), whereas the difference between the localities compared for the two species of *Ischnura* cited is 3900 feet (1188 m.) for *I. ramburi* and 4100 feet (1250 m.) for *I. denticollis*.

Attention has been called, *anteà*, page 13, to the relatively high variability in the point of termination of the second sector of the triangle in this species, which also furnishes examples of three antenodals, of a cross-vein in the quadrilateral and of an additional supplementary basal postcostal cross-vein. All these peculiarities render appropriate the proposed specific name of *mutans*.

Palaemnema peruviana Ris (Pl. X, figs. 56A–G′, apps. ♂.)

1918. *Palaemnema peruviana* Ris, Arch. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, pp. 92, 97, fig. 52 (apps. ♂). (Pozuzo, Peru; 1♂.)

Material examined. The type male cited above, in the collection of Dr. F. Ris, at Rheinau, Switzerland.

The following description is based on my notes made from the type male, Aug. 16, 1929, but some data from Dr. Ris's original description are added in [ ].

♂. Pronotal fore lobe pale yellow with a narrow, mid-dorsal, black line; mid and hind lobes brown, a small, pale blue, lateral spot on the mid lobe, a pale livid spot on each side of

[56] Biol. Centr.-Amer., Neur., pp. 387–389, (1907).

hind lobe. Propleuron dark brown, narrowly edged with yellow inferiorly.

Blue antehumeral stripe [absent from the dorsal third of the mesepisternum], .125 mm. wide at midheight of the sclerite, as compared with .9 mm., the combined width of the fused black humeral and interpleural sutural stripes at the same level. Mesinfraepisternum black, postero-inferior angle narrowly pale. Mesepimeron entirely black, due to the fusion of the two stripes just mentioned. No dark markings on the pectus.

Tergites of abdominal segments eight and nine blue, an inferior, longitudinal, black stripe each side, occupying only the hindmost third of eight but the entire length of nine; ten black.

Wings uncolored. Postnodals: front wings, 16; hind wings, 15 and 16. Nodal sector arising at the eighth postnodal, front wings; sixth, hind wings. Ultranodal arising at the ninth postnodal, front wings; at the seventh and eighth, hind wings.

Superior appendages with the ventral margin not angulate where the appendage enlarges, superior tooth situated at .47 of the appendage-length, apex of the appendage not excised. Basal tooth of the inferiors not visible without relaxing, [absent, only a very blunt tubercle].

Dimensions. Abdomen, 39.5. Hind wing, 27. Stigma, front wing, costal margin 1.07 mm.

Habitat. Dr. Ris states, in his description, that the type specimen was received from Hermann Rolle, and informs us, page 4, that this person, operating in Berlin, under the firm name of "Kosmos," sent him specimens with the label "Pozuzo, Süd Peru." "Der Ort ist nicht näher charakterisiert und der Sammler mir unbekannt. Es ist zweifellos ein Waldgebiet wie am Rio Negro der kolumbischen Ost-Kordillere und am Rio Songo in Bolivia, die Libellenfauna von durchaus entsprechendem Charakter."

The map of Peru issued by the Geographical Society of Lima in 1912[57] shows a Pozuzo at South Latitude 9° 58′, West Longitude 75° 24′, altitude 803 meters, situated at the junction of the Rio Huancabamba and the Rio Pozuzo, the united river as continuing the name Rio Pozuzo and as emptying into the Rio Palcazu. The Rio Palcazu is a tributary of the Rio Pachitea, which in turn joins the Uacayali, the well known branch of the

[57] Mapa del Peru por la Sociedad Geográfica de Lima Dibujado por Camillo Vallejos Z Cartógrafo de la Sociedad Editado por la Libreria é Imprenta Gil. 1912 Escala 1/1.500,000 (100 Km = 8 cm.). In 4 sheets. In the library of the Academy of Natural Sciences of Philadelphia.

Amazon. Pozuzo is in the Province of Huanuco near the boundary line separating this province from Junin. While the latitude of Pozuzo is hardly that of "Southern Peru," this locality may be the source of Dr. Ris's type.

Palaemnema melanostigma Hagen (Pl. X, figs. 57A–G, apps. ♂, penis; Pl. XX, fig. 87, thoracic pattern.)

1860. *Palaemnema melanostigma* Hagen, Bull. Acad. roy. Belg., (2), x, p. 436. (Puerto Cabello [Venezuela], Collect. Hagen; ♂.)

1886. *Palaemnema melanostigma* Selys, Mem. couron. Acad. roy. Belg., XXXVIII, p. 149.

Material examined. VENEZUELA: San Estebán, Carabobo, February 2, 7 and 8, 1920, J. H. and E. B. Williamson and W. H. Ditzler collectors, 3♂, 1♀, in coll. E. B. Williamson.

Among de Selys' MSS. shown to me at the Brussels Museum was a sheet containing the following description, which may be that referred to on p. 149 of the Revision of 1886 as the "description plus détaillée que j'ai faite alors."

Palaemnema melanostigma Hagen.

Long. tot. 38 mm. abdom. 31. app.s. environ 3/4 tib. post. 4 lat. cap. 4 al. s.-i. 27 Lat.a.s. 5—i. 4½ pter. 1⅕.

Stature de *Lestes viridis*. Tete petite noir opaque excepté la lèvre inferieure qui est livide et *une bande transverse blanc luisant occupant l'epistome la base de la lèvre supèrieure et le coin des machoires.* Les trois premiers articles des antennes livides, le 1er très-court, le second trois fois plus long que le 1er le 3e ayant plus de double des deux premiers reunis, la soie, noire plus longue que les trois premiers articles.

Prothorax arrondi en arrière, noir marqué d'une tache bleue laterale arrondi sur chacun de ses trois divisions.

Thorax grêle, *noir opaque avec une raie bleue antèhumerale étroite court touchant le bord* anterieure et *une latérale bleuâtre pale sous l'aile supérieur.* Cette raie communique par en haut sous l'aile inférieure avec le livide pâle qui occupe le bord postérieure et la poitrine.

Abdomen mediocre noir avec un demi anneau basal très-étroit jaune livide aux 3.4.5e et peutêtre 6e segment se prolongeant en dessous lateralement. Le dessus des 8e et 9e segments bleu clair. Le 10e noirâtre moitié plus court que large. Il a le tiers du 9e.—le 8e segment plus long que les deux derniers segments reunis.

Appendices anals plus long que le dernier segment; noirâtres; analogue pour la forme à ceux des *Lestes*. Les superieures en crochets semicirculaires (celui qui existait a été perdu avant d'être décrit) les inférieurs presque aussi longs noirâtres coniques épais un peu distants presque droits le pointe un peu courbée en dedans la base portant en dedans une petite dent.

Pieds assez longs grêles, à tibias herissés de cils très longs. Ils sont livied un peu lavés de noirâtre aux articulations.

Ailes à peine salies; à ptérostigma noirâtre epais *carré irregulier* (*le côté interne le plus court oblique, l'externe convex, l'inférieur le plus* long.

17–19 postcubitales, la dernière non prolongée.

(Decrire le reste d'apres le dessin)

Patrie Puerto Cabello, d'apres un mâle de la collection de M. Hagen. Par la réticulation de la base des ailes elle rapelle la *Paulina* avec un ptérostigme analogue à une espece de Shanghai."

P.S. se place près de *paulina* dont elle diffère
par le point d'arrivée du sect. trig. 2 et par
le petit nombre de cellules sous le pterostigma.

The description above copied was in ink in the original MS., and is reproduced here *verbatim et litteratim* and with only the punctuation of the original MS.

To it de Selys added notes in pencil as here copied in paragraphs set back from the margin. The first of these notes would seem to be at least as recent as his colored drawings of *melanostigma, i.e.,* 9 Oct. 1884.

This description agrees with Selys' colored drawings of *melanostigma* except as to the pterostigma, which drawings show the *external* side as the "plus court."

On the sheet of colored drawings of *P. melanostigma* are the following notes in pencil in Selys' hand:

D'apres la diagnose peutêtre incomplete. Peutêtre identique avec clementia dont elle différe par la levre et l epistome et les dessins du thorax et par le pterost. plus court (comme chez nathalia). [and opposite the drawing of the side of the thorax to which a line runs is the following:] "raie pâle communiquant par le triangle sous l'aile inf. avec le livide de la poitrine et du bord posterieur.

A copy of the preceding description by de Selys and of the notes on his colored drawings was kindly compared by Mr. Nathan Banks with Hagen's type male of *melanostigma,* which is preserved at the Museum of Comparative Zoology, Cambridge, Massachusetts. Mr. Banks wrote, February 5, 1930, of the results of this comparison: "On the species *melanostigma* the pale is now faded pale green, possibly with a little blue in it. I presume it was blue when alive. The band on the face is very distinct and occupies one-half of the lip. The description of Hagen [Selys] is very good. I have noted a few particulars.

The tibiae now have a black line above on tibia I and behind on tibiae II and III. The pale on the corner of the "bord postérieur" is hardly connected to the pale stripe. On one side the black is very slender but continuous, on the other side it is fairly broad and the spot well shut off. Some of the abdominal segments are gone and the superior appendages also. The 10th segment is 3 times as broad as long. Front wing 19, hind wing 17 postcubitales."

The following data from the material from San Estebán furnish differences from and additions to the detailed Selysian description given above.

♂. Lateral extremities of the transverse occipital carina distinct but rounded. The "bande transverse luisant" on the head pale blue. In counting the antennal joints, Selys has apparently reckoned the antennal sclerite of the head as the first antennal joint, as only by so doing can one reconcile the proportions of the several joints in his account.

Blue antehumeral stripe 1.3–1.6 mm. long, narrowing upward, occupying the lower .38–.5 of the mesepisternum; remainder of the dorsum bronze green, extending to the obsolete interpleural suture. Mesinfraepisternum black, pale inferiorly. The blue stripe on the anterior half of the metepisternum is confluent with the pale (blue?) of the metepimeron above the dorsal end of the blackish stripe of the second lateral (metapleural) suture, just below the base of the hind wing, in the male of Feb. 8, while in the other two the confluence is narrowly interrupted by the blue metepisternal stripe being bordered by a narrow black edging at its upper end. See Plate XX, fig. 87.

Abdominal segment seven has a yellowish, basal half-ring, such as segments three to six possess. Segment eight varies in coloring. In the males of Feb. 2 and 7, it is blue with the intersegmental articulations seven to eight and eight to nine and an inferior, longitudinal stripe, occupying the posterior half or two-thirds of the segment's length, dark brown. In the male of Feb. 8 it is dark brown or black, with ill defined paler brown, or possibly even blue (in life), areas on each lateral surface from base narrowly caudad to half the segment's length and ending dorsad to the inferior, longitudinal, brown stripe which occupies the posterior two-thirds of the segment's length. Segment nine blue with a transverse black band at each end, that at the base .16 mm. wide mid-dorsally but becoming narrower ventrad on each side; apical band varying in mid-dorsal width from .08 to .57 mm., becoming wider or narrower ventrad on each side and

confluent below with an inferior, longitudinal, dark brown stripe which occupies most of the length of the segment and with which the transverse basal band may or may not be confluent. Ten entirely black or with a transversely elongated bluish or lilaceous spot on each side of the tergite.

Wings uncolored. Postnodals: front wings, 19 (20 in one wing only); hind wings, 17–18 (18 more frequent). Nodal sector arising: front wings, at the seventh postnodal; hind wings, at the fifth or sixth (fifth). Ultranodal arising at the eighth postnodal, front wings; at the sixth to eighth (seventh) hind wings; or, in cells behind the median vein, proximad to the stigma, front wings, 9–10; hind wings, 8–11 (10). Upper sector of the triangle ending *proximad* to the level of origin of the ultranodal by $\frac{1}{2}$ to 2 marginal cells in two males, but in that of Feb. 8 *distad* to that level by 2 marginal cells, front wings; but in the hind wings of all three males, ending distad of that level by 2–5$\frac{1}{2}$ cells in the area behind the ultranodal (3–9 marginal cells). Cells surmounted by the stigma, front wings, 1–2 (1); hind wings, 1–2 (1).

Superior appendages with the inferior margin hardly angulate where the appendage enlarges, superior tooth at .54 of the appendage-length, its tip acute, apex of the appendage very slightly excised. Inferior appendages with the basal tooth slender, spinelike, its length equal to about one-third of the width of the apex of the superiors.

♀. Differences from the male in addition to those indicated in the key, pages 28–29: Pale spots on the mid and hind pronotal lobes smaller, perhaps green rather than blue in life, the mid-dorsal dark brown or black of the mid lobe at least four times as wide as the green spot of either side.

Blue antehumeral stripe 1.47 mm. long, on the lower half of the sclerite. Pale stripe on the metepisternum yellow rather than blue, only barred from confluence at its upper end with the yellow of the metepimeron by a dark brown line on the metapleural suture, the prolongation upward of the dark stripe thereon.

Abdominal segment eight dark brown with a small bluish spot each side inferiorly at base; ten black with a narrow, transverse, pale brown spot each side. Appendages and genital valves dark brown, the uncovered apex of the ovipositor pale green or blue.

Postnodals: front wings, 17, 18; hind wings, 17, 16. Nodal sector arising: front wings, between sixth and seventh and between seventh and eighth postnodals; ultranodal at eighth and ninth postnodals, front wings. Upper sector of the triangle

ending asymmetrically with respect to the level of origin of the ultranodal, viz., at 2 marginal cells *distad* to that level (right), *at* that level (left), but on both hind wings *distad* to that level by 3–4 cells behind the ultranodal (5 marginal cells). Stigma surmounting one cell, all wings.

Dimensions. Abdomen: ♂, 35.5–37.5; ♀, 28. Hind wing: ♂, 24.5–25; ♀, 22. Stigma: front wings, costal margin, ♂ ♀, .90 mm.

Habitats. Mr. Williamson writes:[58] "San Esteban, Venezuela. A village on the Rio San Esteban about six miles back of Puerto Cabello. The Rio San Esteban is a clear, swift, rocky mountain stream, except near its mouth below San Esteban, where it flows for several miles through a nearly level sand plain. . . . We could not obtain elevations at San Esteban, but our collections were made from nearly sea level up to possibly 2,000 or 3,000 feet at the heads of the highest quebradas." His description of the river valley is longer than we have here quoted, but there is nothing on the labels of the present specimens to indicate their precise habitats. In the same paper, he has listed the *Hetaerinae* of the valley, wherein he took also *Philogenia cassandra* in great numbers.[59]

Palaemnema gigantula new species (Pl. X, figs. 58D–E, L, M, genitalia ♂; Pl. XI, figs. 58A–C, F, G, apps. ♂; Pl. XX, fig. 88, thoracic pattern.)

1917. *Palaemnema* sp. A. S. & P. P. Calvert, A Year of Costa Rican Nat. Hist., p. 255. (Peralta, Costa Rica; habits.)

Material examined. Costa Rica: Peralta, 1055 feet (322 meters), August 8 & 10, 1909, P. P. Calvert collector, 1 pair + 2♂.

Type. Male, August 8, 1909, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

Paratypes. The other three specimens.

The following notes were made on the colors of the specimens soon after capture.

♂. Black, with metallic green reflections on the thoracic dorsum. Eyes black, faintly bluish below. Labrum (except its free edge black), nasus [error for rhinarium] and external surface of mandibles pale blue or almost cream-color. Labium, ventral surface of thorax, metepimeron, venter of abdominal segment

[58] Occas. Papers, Mus. Zool. Univ. Mich., no. 130, p. 40, (1923).
[59] Calvert, Trans. Amer. Ent. Soc., L, p. 22, (1924).

one, ventral basal fourth of three to eight pale bluish yellow. Anterior margin, a confluent lateral spot and a mid-dorsal spot on the median prothoracic lobe, a stripe on the obsolete first lateral thoracic [interpleural] suture, wider than the black stripe posterior to it, and the dorsal surface of eight to ten deep blue. (Two ♂.)

♀. Like the ♂, but eyes greenish below, blue markings of mid prothoracic lobe very dull and indistinct; stripe on interpleural suture pale green and narrower than the black stripe posterior to it; eight to ten blackish, only the faintest trace of obscure bluish on the middle of each side of each.

The following description is from the dried specimens, years later.

♂. Lateral extremities of the transverse occipital carina angular or subangular. Nasus (postclypeus) shining black, its free margin blue.

Pronotum: fore lobe blue, mid lobe dark brown with an anterior mid-dorsal spot, and a spot each side blue, the latter confluent with the blue of the fore lobe and of the anterior part of the propleuron; hind lobe blackish brown. Propleuron, anterior half bluish, posterior half dark brown or black.

No pale antehumeral stripe, no black on the interpleural suture. Mesepisternum somewhat bronzy greenish black. Antero-dorsal part of mesepimeron dark brown, more or less continuous with the black of the mesepisternum. Mesinfraepisternum pale blue. Dark stripe on second lateral thoracic (metapleural) suture .37–.44 mm. wide at midheight.

Tergites of eight to ten pale blue, sides inferiorly dark brown or black for the entire length of nine and ten and for the posterior half to fourth of eight; eight has also a transverse black ring in its basal seventh to eleventh.

Wings uncolored. Postnodals: front wings, 18–20 (20 most frequent); hind wings, 17–19 (17). Nodal sector arising: front wings, at the seventh postnodal; hind wings, from between the fifth and sixth to the sixth (at the sixth, most frequent). Ultranodal arising: front wings, at the eighth or ninth postnodal (eighth); hind wings, at the seventh or eighth (seventh); or, in cells behind the median vein, proximal to the stigma, front wings, 9–11 (10); hind wings, 8–12. Upper sector of the triangle ending distad to the level of origin of the ultranodal by, front wings, $\frac{1}{2}$–$1\frac{1}{2}$ cells behind the ultranodal ($\frac{1}{2}$–$2\frac{1}{2}$ marginal cells); hind wings, $3\frac{1}{2}$–$6\frac{1}{2}$ cells, etc. (5–10 marginal cells). Cells surmounted by the stigma, front wings, two to more than two (2); hind wings, less than two to less than three (less than 2).

Superior appendages, 1.04–1.18 mm. long, with the inferior margin not angulated where the appendage enlarges, a tooth on the *mesal*, not superior, surface at .44–.5 of the appendage length, having an almost rectangular tip, apex of the appendage excised at 90° or more, the superior margin produced as an overhanging process having almost the form of a quadrant of a circle, the excised part of the apical margin, below this process, being nearly straight, or shallowly concave, and meeting the inferior margin of the appendage almost at 90° at .67–.7 of the appendage-length. Inferior appendages with the basal tooth shorter than the width of the process at the apex of the superiors.

♀. Differences from the male in addition to those given above for the living colors and indicated in the key, page 29:

Wings milky throughout. Postnodals: front wings, 19, 18; hind wings, 15, 16. Upper sector of the triangle, left front wing, ending *proximad* to the level of origin of the ultranodal by ½ marginal cell. Cells surmounted by the stigma: front wings, 2 (right); more than one (left); hind wings, 2 (right), less than 2 (left).

Dimensions. Abdomen: ♂, 47–48; ♀, 40. Hind wing: ♂, 25.5–26.5; ♀, 26.5. Stigma, front wings, costal margin, ♂ 1.00–1.29, ♀ 1.18 mm.

Habitat and Habits. Near the railroad station of Peralta there was, in August, 1909, a slow-moving bit of stream locally called "laguna." Just beyond the laguna were low woods, consisting of small trees, arums, ferns, heliconias and numerous vines or creepers (lianas). Here, in the afternoon of August 8, I found the pair of this *Palaemnema* listed above, *in coitu*, the male holding the prothorax of the female with his appendages, and resting upon a leaf. Hoping to learn something of their egg-laying habits, I stood in the mud for forty minutes, keeping my eyes fixed on the pair. Observation began at 12.35 P.M. At 12.44 they flew to a second leaf, at 12.48 to a third, at 12.54 to a fourth, at 1.10 to a fern pinnule; at 1.15, fearing I might lose them, I caught them in my net. All the time they were under observation, only the male rested on the leaf, he sustaining the whole weight of the female. Every now and then he opened his wings but soon shut them again; the female kept her wings shut. Resting there in the shade, the most conspicuous part of both sexes was the pale anteclypeus and labrum. In this same low woods were taken a second male of *Palaemnema gigantula* and the male type of *Miocora peraltica*[60] on August 8, and the third

[60] Calvert, Ent. News, XXVIII, p. 259, (1917).

male of the former on August 10. A search in the same locality on March 23 and 24, 1910, failed to find any *Palaemnema* or *Miocora*. A small clearing had been made here and a miscellaneous lot of vegetables and bananas planted. This with the drier weather prevailing had changed the character of the spot so much that I could hardly recognize it.

The males of this species of *Palaemnema* possess the longest abdomen yet observed in this genus, hence the proposed specific name.

Palaemnema brucei new species (Pl. XI, figs. 59A–G, apps. ♂, penis; Pl. XX, fig. 89, thoracic pattern.)

Material examined. PANAMA: Porto Bello, April 17, 1912, August Busck collector, 1 ♀, in coll. U. S. National Museum.

COLOMBIA: Cristalina, 1050 feet (320 meters), February 12, 15–19, 1917, J. H. & E. B. Williamson collectors, 78 ♂, 2 ♀, in coll. E. B. Williamson.

Type. Male, Cristalina, February 16, 1917, in coll. E. B. Williamson.

Paratypes. All the remaining specimens from Cristalina.

The following notes on the living colors of a male of Feb. 12 were made by Mr. E. B. Williamson: Eyes above black. Pale color of thorax, face and apex of abdomen bright clear blue.

The dried specimens show the following features:

♂. Transverse occipital carina varying individually in prominence, its lateral extremities subangulate or rounded. Nasus chiefly blue with a narrow, basal, transverse, black stripe.

Pronotum with a separate blue spot on each side of each of the three lobes, which, with the inferior antehumeral spot, make a row of four spots on each side; in at least one male (of Feb. 17) the blue spots of the hind lobe are absent and the right antehumeral spot is very small (.25 mm.), while the spots of the other two prothoracic lobes are very distinct. Propleuron chiefly blackish.

Blue antehumeral stripe represented by an inferior, obcuneate, blue spot, .33–.65 mm. long. Bronze violet of the thoracic dorsum reaching almost to the obsolete interpleural suture, but not infrequently (10 ♂ at least) the blue of the metepisternum invades the dark of the mesepimeron near the lower third of the latter and for one-half the width of the sclerite or less. Mesinfraepisternum of the same dark coloring but with an ill-defined pale spot at the postero-inferior angle.

Tergite of abdominal segment eight dark brown or black with only the hindmost fourth, fifth, or rarely eighth, blue; often also a small pale spot each side at base; one otherwise normal male (Feb. 16) has no blue at the apex of eight; nine and ten blue, each with an inferior, lateral, black stripe as long as each segment.

Superior appendages with the inferior margin not angulate where the appendage enlarges, a superior tooth at .4–.5 of the appendage-length, its tip acute, apex of the appendage not excised in supero-internal or in profile view. Inferior appendages with the basal tooth shorter than one-fourth of the width of the apex of the superiors.

♀. Differences from the male in addition to those indicated in the key, pages 28–29: Nasus reddish brown, blackish along the anterior margin, a paler spot each side. Pronotal and antehumeral blue spots absent. Tergite of abdominal segment eight black, a pale inferior spot each side at base; ten blackish above, each side pale brown inferiorly.

♂ ♀. Wings uncolored. The following data are based on a tabulation of 23♂, 2♀, here grouped together because of the few individuals of the latter sex, which, moreover, always fall within one of the male groups in the respective characters. Postnodals: (*a*) front wings, 16–20 (17, 40%, 18, 34%); (*b*) hind wings, 14–19 (16, 40%, 17, 34%). Nodal sector arising: (*c*) front wings, at the sixth to the eighth postnodal (seventh, 64%); (*d*) hind wings, at the fifth to the seventh (sixth, 62%). Ultranodal sector arising: (*e*) front wings, at the seventh to the tenth postnodal (eighth, 60%, ninth, 34%); (*f*) hind wings, at the seventh to the ninth (eighth, 62%, seventh, 34%); or in cells behind the median vein, proximal to the stigma; (*g*) front wings, 7–12 (9, 42%, 8, 28%); (*h*) hind wings, 7–10 (9, 40%, 8, 38%). Upper sector of the triangle ending: (*i*) front wings, *distad* to the level of origin of the ultranodal (by $\frac{1}{2}$–$2\frac{1}{2}$ cells behind the ultranodal = $\frac{1}{2}$–$3\frac{1}{2}$ marginal cells) in 36%, *at* that level in 20%, *proximad* to that level (by $\frac{1}{2}$–3 cells behind the nodal = $\frac{1}{2}$–5 m. c.) in 44%; (*k*) hind wings, *distad* to that level (by $\frac{1}{2}$–$4\frac{1}{2}$ cells behind the ultranodal = $\frac{1}{2}$–$6\frac{1}{2}$ m. c.) in 98%, *at* that level in 2%. Cells surmounted by the stigma: (*l*) front wings, one to more than two (more than one, 58%); (*m*) hind wings, one to more than three (more than one, 56%). Color of stigma in strong sunlight Van Dyke brown to Roman sepia of Smith's *Glossary of Entomology*.

The following figures give the numbers of individual insects whose wings are asymmetrical with respect to each of the preceding categories *a–m*: *a*, 12♂, 1♀; *b*, 11♂; *c*, 11♂, 2♀; *d*, 10♂, 1♀; *e*, 10♂, 1♀; *f*, 9♂; *g*, 13♂, 2♀; *h*, 16♂, 1♀; *i*, 8♂, 1♀; *k*, 1♂; *l*, 12♂, 1♀; *m*, 15♂, 2♀.

Dimensions. Abdomen: ♂, 33–39.5; ♀, 30–32. Hind wing: ♂, 22–27; ♀, 24. Stigma, front wing, costal margin, ♂ .98–1.10, ♀ 1.06–1.14 mm.

Habitats and Habits. Mr. Williamson has given the following description[61] of Cristalina, on the Rio Magdalena, 28 kilometers above Puerto Berrio, where this species was taken. "It lay in a densely wooded country abounding in beautiful small streams. Conditions were humid, vegetation was rank and small tree ferns were noted. A small stream, the Quebrada Cristalina, flowed directly through Cristalina. The water of this stream was brought from the hills to the village and railroad through an iron pipe. During our first day at Cristalina, February 12, we followed this pipe back to the intake. Between the intake and the town the stream flowed largely through pasture and brushland, but above the intake it flowed in forest. Here it was only two to three feet wide and was frequently lost in the stony, gravelly bed. It had its origin in the hills about a mile above the intake. The richness and peculiarity of its dragonfly fauna may be realized from the fact that our first day's collecting yielded a Miocora, two species of Palaemnema, a Perilestes, three protoneurines, three Heteragrions, a Philogenia, an Allopodagrion, an Acanthagrion, a Megaloprepus, two Mecistogasters, and numbers of Argias, Hetaerinas, and libellulines." Other streams in the neighborhood are described at some length, although without reference to *Palaemnema*. On the envelope containing two males of *P. brucei*, taken February 16, Mr. Williamson placed these notes: "Becomes active in late afternoon (4–5 p.m.), not seen in a.m. at same places it is found in p.m. Apparently earlier in day rests very near ground in nooks over water or near water in densest shade—slender small palm-like aquatics (1–3′ high). About 4 p.m. comes out and rests on leaf edges, on bushes, etc., in ravine. At 4 p.m. the ravine is in complete shadow and is dark and gloomy." To a male taken February 17 is attached the note: "In small gully," and on two envelopes of the following day: "In little tributary late p.m.," "These 4 taken in little tributary. Spent only few minutes there, and late in p.m."

[61] Univ. Mich. Mus. Zool. Misc. Publ., no. 3, pp. 16–17, 1918. [He has another account in the Occas. Papers of the same, no. 130, p. 29, 1923.]

This species is named in honor of Mr. Edward Bruce Williamson, of Bluffton, Indiana, who collected so much of the South American material described in this paper, known for his indefatigability as a collector, the minuteness of his discrimination of species, his generosity to other students.

This species also shows venational variations of family or generic value. Of the seventy-eight males from Cristalina, three front wings, five hind wings have three antenodals; two front wings have no inferior sector of the triangle, one front wing has it incomplete, one front wing has it two-branched; six front wings, four hind wings have an additional supplementary postcostal cross-vein.

Palaemnema azupizui new species (Pl. XII, figs. 60A–G, apps. ♂, penis; Pl. XX, fig. 90, thoracic pattern.)

Material examined. PERU: San Nicolas to Miriatiriani, July 9, 1920, Cornell University Expedition lot 569, 1♂.

Type. The male above named in coll. Cornell University, Ithaca, New York.

♂. Lateral extremities of the transverse occipital carina sloping gradually to the rear surface of the head. Nasus (postclypeus) dark shining green.

Pronotum faded, apparently a blue spot on each side of the mid lobe, perhaps much of the fore lobe blue, much of hind lobe reddish brown, especially in the middle, remainder of pronotum black. Propleuron black.

No pale antehumeral stripe, the dark metallic green of the thoracic dorsum extending on each side to the obsolete interpleural suture. Mesinfraepisternum black, perhaps a small blue spot at the infero-posterior angle. Apparently no dark markings on the metasternum.

Tergite of abdominal segment eight black except for a blue spot each side inferiorly, occupying the anterior fourth. Tergites of nine and ten blue, nine with a transverse black stripe on its basal tenth and both segments with an inferior, longitudinal, black stripe each side for the entire length of each.

Wings uncolored. Postnodals: front wings, 17, 19; hind wings, 17. Nodal sector arising: front wings, at the eighth or between the seventh and eighth postnodals; hind wings, at the sixth.

Ultranodal sector arising: front wings, at the tenth or ninth postnodal; hind wings, at the eighth; or in cells behind the median vein, proximal to the stigma, front wings, $7\frac{1}{2}$ and 10; hind wings, 8 and 9. Upper sector of the triangle ending: front wings, *proximad* to the level of origin of the ultranodal by $1\frac{1}{2}$ (right), $\frac{1}{2}$ (left) cells behind the nodal sector ($2\frac{1}{2}$ and 1 marginal cells); hind wings, *distad* to that level by $3\frac{1}{2}$ (right), 3 (left) cells behind the ultranodal (5 m. c.). Cells surmounted by the stigma: front wings, more than one; hind wings, 2 (right) more than one (left).

Superior appendages with the inferior margin not angulate where the appendage enlarges, a superior tooth at .46 of the appendage-length, apex of the appendage rounded, not excised. Basal tooth of the inferiors represented by a short rounded tubercle.

Dimensions. Abdomen, 40. Hind wing, 26.5. Stigma, front wing, costal margin 1.06, hind margin 1.31 mm. ♀ unknown.

Habitat. Professor J. Chester Bradley, who led the Cornell University Expedition, has kindly given me the following notes bearing on the region in which this specimen was collected. "San Nicolas and Miriatiriani are tambos or stations on the Camino del Pichis, which is a mule path connecting the civilized part of Peru, west of and including the Andes, with the head of navigation on the upper tributary of the Amazon. Despite its very primitive character as a road, it is the chief highway between the West and the Province of Loreto.

Date		Distance from La Merced	Altitude
Night of July 7	Tambo San Nicolas	153 km.	905 m.
Night of July 8	Tambo Azupizú (Rio Azupizú)	167 km.	423 m.
Night of July 9	Tambo Miriatiriani or San Beatriz	189 km.	294 m.

About 3 miles beyond the village of San Luis, trail leaves the Rio Paucartambo, and ascends rapidly the Cerro de Sal, reaching the summit in 6 more miles. From there almost until San Nicolas is reached the trail follows along the ridges. It then descends to the tropical lowlands, reaching the Rio Azupizú at kilometer 167. One is then definitely east of the mountains, and remains at a low altitude for the remaining 30 miles to the Rio Pichis.

Night of July 8. Tambo Azupizú on the Rio Azupizú. Here were swarms of butterflies of great variety and brilliant color, in the yard of the tambo, and along the river. We are here in tropical lowland fauna and flora.

Night of July 10. Camp on bank of Rio Aguachini, in flood and impassable. Large bees (Oxaaea?) are buzzing around in a frenzied manner, chasing each other, or occasionally having poised in mid air. Waving a net excited them and they would come buzzing toward, off again in a flock, but now and then one would become entangled in the net.

Definitely down from the mountains, we again find many things that we found in the Colony of the Perené, but which were absent from the highlands, and still more strictly lowland tropical forms. It is very clear that the Cerro de Sal have a distinctive fauna."[62]

Comparison. The type of *P. azupizui* was compared with that of *P. peruviana* Ris in Dr. Ris's collection at Rheinau, August 16, 1929. It resembles *peruviana* in appendages (but also differs therein, *cf.* Pl. X, figs. 56A–G′, with Pl. XII, figs. 60A–C, F–G) and differs further in having the dorsum of abdominal segment eight black, of ten blue (8 blue, 10 black in *peruviana*), no pale antehumeral stripe, pronotum more obscure, its pale marks (if present) more violaceous.

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[62] The map of the Geographical Society of Lima, quoted in footnote 57, page 67, *antea*, shows La Merced in the northern part of the Province of Junin, at 11° 4′ S. Latitude, 75° 24′ West Longit., elevation 775 m., and San Luis de Shuaro at 10° 53′ S. Lat., 75° 24′ W. Long., altitude 756 m.; the Rio Paucartambo as a tributary of the left bank of the Rio Perene; the Cerro de la Sal running east to west; the Rio Azapizu (spelled with an *a*) as arising on the north side of this Cerro and flowing north into the Rio Pichis, this in turn into the Rio Palcazu and the last into the Rio Pachitea. A trail shown from La Merced through S. Luis de Shuaro, crossing the Cerro de la Sal, following the left bank of the Rio Azapizu to Puerto Bermudez on the Rio Pichis (which is marked as the head of navigation) is doubtless the Camino del Pichis of Dr. Bradley's notes. The latitude of P. Bermudez is 10° 26′ S., Long. 75° 1′ W. Neither S. Nicolas nor Miriatiriani is shown. The locality from which the type specimen of *P. azupizui* came is thus not far distant from that of the type of *P. peruviana* Ris (see page 67 *antea*). The three rivers Huanacabamba, Palcazu and Azapizu all have a northerly course and are roughly parallel. There is another and a larger Rio Paucartambo in Peru, viz., in the Province of Cuzco between 11° 30′ and 13° 0′ S. Lat., 72° and 73° W. Long. As to the spelling of the name of the river, Dr. Bradley wrote: "I have looked up a copy of *Boletin del Cuerpo de Ingenieros de Caminos* for February, 1919, number 23, published by the Ministerio de Fomento of Peru. This consists of a detailed report on the so-called Via Central, or in other words, the Pichis Highway. In this report I find the spelling Azupizú occurring repeatedly, and so far as I have noticed the only spelling used . . . as far as I recall, the pronunciation of the place by the people there accorded with the spelling Azupizú rather than Azapizú. Please also note that according to the spelling of this report, there is an accent on the final syllable of the word."

Palaemnema apicalis Navás (Pl. XII, figs. 61A–C, F, G′, apps. ♂; Pl. XIII, figs. 61D–E, penis; Pl. XX, fig. 91, thoracic pattern.)

1923. *Palaemnema apicalis* Navás, Boletin Soc. Colombiana Cien. Nat., XII, p. 361. (No description. Medina, junio de 1918.)

1924. *Palaemnema apicalis* Navás, Mem. Real Acad. Cien. Artes, Barcelona, (3), XVIII, 13, p. 14, fig. 8 (apps. ♂, details of wing). (Colombia: Medina, Enero de 1918.)

Material examined. The type male bearing the following three labels: (1) green, "Medina (Colombia) I 18"; (2) green, "Palaemnema apicalis Nav Navás S.J.det."; (3) pink, "Typus." In coll. R. P. Longinos Navás.

Thanks to the kindness of Father Navás, in lending me his unique type, I am able to present here the following detailed description and accompanying figures.

♂. Lateral extremities of the transverse occipital carina fading out gradually with no terminal projection. Labrum retracted so that the rhinarium (anteclypeus) is not visible and the mandibles are almost entirely uncovered, the pale blue of their lateral surfaces showing plainly, hence perhaps the "labro lateraliter caeruleo-pallido" of the description. Labrum pale blue, its free margin bordered with black whose width at middle is .25 mm. Nasus (postclypeus) dark shining blue, its anterior margin very narrowly yellow.

Pronotum: fore lobe chiefly blue with a slight mid-dorsal infuscation; mid lobe blackish with an obliquely elongated blue spot each side, confluent below with the blue of the fore lobe, elsewhere sharply margined with black; hind lobe obscure brownish. Propleuron chiefly dark brown to blackish, paler along inferior margin.

Thorax largely destroyed by dermestids (for color pattern see Pl. XX, fig. 91). No blue antehumeral stripe. The "fascia antehumerali ferruginea" occupies the lateral half of the mesepisternum and the whole of the mesepimeron. The boundary between it and the mid-dorsal black (which has some greenish reflections) is not very distinct and, owing to the broken condition of the thorax, it is not possible to give accurately the relative widths of the ferruginous and of the black. The ferruginous area extends down to the "fascia obliqua flavo-eburnea" which occupies the antero-superior half of the metepisternum. The dark band on the inferior half of the same sclerite is dark brown, almost black, and borders the second lateral thoracic (metapleural) suture; below this suture the band is paler brown. Mesinfraepisternum blackish, pale inferiorly.

Abdominal segments four to seven (not 4–8) with the yellow transverse basal band .4–.5 mm. wide on mid-dorsal line. Tergites of eight to ten black, eight with an inferior blue stripe each side occupying the anterior one-third of the segment's length.

Wings uncolored. Postnodals: front wings, 21; hind wing (right lost), 20. Nodal sector arising: front wings, at the eighth (right) or ninth (left) postnodal; hind wing at the seventh. Ultranodal sector arising: front wings, at the tenth postnodal; hind wing, at the ninth; or, in cells behind the median vein, proximal to the stigma, front wings, 10; hind wing, 11. Upper sector of the triangle ending distad of the level of origin of the ultranodal by: front wings, 2 cells in the area behind the ultranodal (3 or 2 marginal cells); hind wing, more than 5 cells, etc. (more than 6 m. c.). Cells surmounted by the stigma: front wings, more than 1 (right) or 2 (left); hind wing, 2 (left). Color of stigma nearest "Cologne earth" of Smith's *Glossary of Entomology*. The statement "Ala posterior area apicale fere 3 venulis" is apparently an error for 9 venulis; at least that is the number on the remaining (left) hind wing. Father Navás's fig. 8b agrees with the left front wing of the type.

Superior appendages with the inferior margin not angulate where the appendage enlarges, a superior tooth at .43 of the appendage-length, apex of the appendage not excised. Inferiors with the basal tooth directed caudad and somewhat dorsad, about one-fourth as long as the width of the apex of the superiors.

♀. Unknown.

Dimensions. ♂: Abdomen, 39.5. Hind wing, 27. Stigma, front wing, costal margin 1.14 (left), 1.23 (right), hind margin 1.55 (both) mm.

Habitat. The locality whence the type came is, perhaps, the Medina situated about 50 kilometers almost due east of Bogota and on the eastern slope of the Cordillera Oriental. The *Times Survey Atlas of the World* (London, 1922, pl. 99) places it in the altitude zone of 3000–6000 feet (914–1828 meters). The specimen was sent to Father Navás by the Reverend Hermano Apolinar Maria, of Bogota.

Comparison. *P. apicalis* is apparently the analogue of *P. carmelita* Ris, of the Cordillera Occidental, but differs from the two specimens of the latter now before me in having the fore prothoracic lobe blue (in *carmelita* brown with rather bright yellow spots); mid-dorsal black, with green reflections, on mesepisternum reaching only about half-way, at midheight, to

the humeral suture (in *carmelita* reaching to this suture); abdominal segment eight slightly longer, *i.e.*, 2.7 mm. (2.3–2.4 mm. in *carmelita*); superior appendages narrower in their distal half; apex of the inferior appendages and details of the tips of the penis filaments different (compare the Plates and figures listed at the beginning of the descriptions of each species).

Palaemnema carmelita Ris (Pl. XIII, figs. 62A–G, apps. ♂, penis; Pl. XX, fig. 92, thoracic pattern.)

1918. *Palaemnema carmelita* Ris, Archiv. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, pp. 92, 100, fig. 54 (apps. ♂). (Colombia: Carmen, Ob. Rio Dagua, Rio Aguacatal; ♂ ♀.)

Material examined. Colombia: Carmen on the upper Rio Dagua, 1400 meters (4590 feet), June 17, 1908, 3♂; Rio Aguacatal, 2000 m. (6560 ft.), 1♂, 2♀, all collected by A. H. Fassl; in coll. Dr. F. Ris, in Rheinau, Switzerland, where I studied them in August, 1929. Colombia: West Cordillere, Villa Elvira, 1800 m. (5900 ft.), July, 1909, A. Fassl, 1♂, Foerster collection in Museum of Zoology, Univ. Michigan, Ann Arbor, Mich. The type is a male from Carmen in Dr. Ris's collection.

♂. Lateral extremities of the transverse occipital carina fading out gradually with no terminal projection. Nasus shining black.

Pronotum brown, fore lobe with a yellow dot each side, mid lobe with an elliptical slaty-blue spot each side, a little wider than the intervening mid-dorsal brown. Propleuron dark brown.

No pale antehumeral or humeral stripes. Thoracic dorsum blackish brown with bronze-green reflections, especially near the mid-dorsal carina. Mesepimeron and metepisternum violaceous, a dark stripe on the metapleural suture varying from .16 (Carmen) to .57 (Villa Elvira) mm. in width, mesinfraepisternum obscure dark brown. No dark markings on the pectus.

Abdominal segments eight to ten entirely black.

Wings uncolored. Postnodals: front wings, 17–19; hind wings, 16–18. Nodal sector arising: front wings, at the seventh or eighth postnodal; hind wings, at the sixth or seventh. Ultranodal sector arising: front wings, at the eighth or ninth postnodal; hind wings, at the seventh or eighth; or, in cells behind the median vein, proximal to the stigma, front and hind wings, 9–11. Upper sector of the triangle ending distad to the level of origin of the ultranodal by: front wings, 1–2½ cells behind the ultranodal (1–4½ marginal cells); hind wings, 3½–4½ cells, etc. (4–6½ m. c.). Cells surmounted by the stigma: front wings,

more than one, or two; hind wings, more than one to more than two. Stigma, in sunlight, black to Roman sepia of Smith's *Glossary*.

Superior appendages with the inferior margin not angulate where the appendage enlarges, a superior tooth at .45–.48 of the appendage-length, apex of the appendage not excised. Inferiors with the basal tooth represented by at most a blunt or triangular tubercle.

♀. Differences from the male in addition to those indicated in the key, page 29: Nasus blackish brown, slightly paler each side. Pronotum obscure, much faded. One front wing has 20 postnodals, two hind wings have 5 and 6 cells as stated above for the upper sector of the triangle (7 to more than 8 marginal cells).

Dimensions. Abdomen: ♂, 41–43; ♀, 39. Hind wing: ♂, 30; ♀, 31. Stigma, front wing, costal margin, ♂, 1.11–1.35, ♀, 1.31; hind margin, ♂ ♀, 1.55 mm.

Habitats. Fassl writes of the upper course of the Dagua valley:[63] "Hier ist der nebelfeuchte Urwald, der die Cordillere krönt, bereits verschwunden, eine dürftige Vegetation ist an seine Stelle getreten, niedere Sträucher und harte Gräser, die oft den nackten, roten Lehmboden hervorsehen lassen. . . . Nur wo der Weg einen von der Cordillere kommenden Bach kreuzt, ist Vegetation u. Insektenleben reichlicher und lebhafter. . . . Nach mehrstundigen Ritte wird der Ort Carmen passiert. . . ." Chapman has given a later description of the Rio Dagua, which empties into the Pacific near the fourth degree of north latitude, accompanied by two views of the landscape.[64]

Of the other two localities, Fassl says: "Mehrere hundert Meter abwärts von San Antonio fliesst zwischen durchaus bewaldeten Gebirgshangen ein kristallheller Bach, der Rio Aguacatal; im obersten Teile wird die Talmulde bei 2200 m Höhe von einer einsamen Besitzung abgeschlossen, der Villa Elvira, dem luxuriös eingerichteten Sommerschlösschen eines Franzosen. . . ."[65] The Rio Aguacatal is shown in Vergara y Villoso's atlas of Colombia as a tributary of the left bank of the Rio Cauca near Cali.

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[63] Ent. Zeitsch., Stuttgart, XXIII, p. 131, (1909). [He speaks of his journey along the Rio Dagua [misprinted Dagna] as having been made between May 13 and 21, 1909.]

[64] Bull. Amer. Mus. Nat. Hist., XXXVI, pp. 23–24, pl. II, (1917).

[65] Ent. Rundschau, Stuttgart, XXXI, p. 42, (1914).

Palaemnema reventazoni new species (Pl. XIII, figs. 63A–C, F, G′, apps. ♂; Pl. XIV, figs. 63D–E′, L, M, genitalia ♂; Pl. XX, fig. 93, thoracic pattern.)

Material examined. Costa Rica: Rio Reventazón valley at the bottom, near Juan Viñas railroad station ("Infernillo"), 2500 feet (760 meters), June 28, 1909, 1 ♂, July 28, 1909, 1 ♂, May 1, 1910, 2 teneral ♂ found transforming, exuviae preserved, P. P. Calvert collector.

Type. The male of July 28, 1909, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

Paratypes. The other three males.

The following description is based on the dried specimens.

♂. Lateral extremities of the transverse occipital carina rounded, not prominent. Nasus (postclypeus) entirely shining dark greenish black in the two mature individuals, brown, paler along the inferior margin in the two tenerals.

Pronotum: fore lobe blue (July) or black (June), mid and hind lobes black, mid lobe with a small round blue spot each side (July), spot absent (June). Propleuron blackish, with one or two bluish spots, the inferior margin more widely yellowish in the tenerals.

No pale antehumeral stripe. Mesepisternum and mesepimeron black (mature), brown (teneral), with greenish reflections. Mesinfraepisternum black, pale at postero-inferior angle. Dark stripe on the metapleural suture .37–.44 mm. wide.

Tergites of abdominal segments eight to ten black, a pair of small, pale, dorsal spots behind the midlength of eight and nine (July), but absent from nine (June). In the tenerals these segments appear to be pale blue or dull brown.

Wings faintly fumose throughout (mature), colorless (teneral). Postnodals: front wings, 20–22 (22 most frequent); hind wings, 17–20 (19). Nodal sector arising: front wings, at the seventh to eighth postnodal; hind wings, at the fifth to seventh. Ultranodal sector arising; front wings, at the ninth or tenth postnodal (ninth); hind wings, at the seventh or eighth (eighth); or, in cells behind the median vein, proximal to the stigma, 10 to more than 11, front and hind wings. Upper sector of the triangle ending distad to the level of origin of the ultranodal by: front wings, $\frac{1}{2}$–$2\frac{1}{2}$ cells behind the ultranodal ($\frac{1}{2}$–$3\frac{1}{2}$ marginal cells); hind wings, 4–$5\frac{1}{2}$ cells, etc. (6–8 m. c.). Cells surmounted by the stigma: front wings, less than two to more than two; hind wings, the same (more than two, most frequent).

Superior appendages with the inferior margin hardly angulate where the appendage enlarges, superior tooth at .4–.43 of the appendage-length, apex of the appendage excised at an obtuse

angle, the superior margin produced as an overhanging process which is as long as wide. Basal tooth of the inferiors shorter than one-half the width of the apex of the superiors.

♀. Unknown.

Dimensions. Abdomen, 34–38. Hind wing, 25–27. Stigma, front wings, costal margin 1.06–1.23 mm.

Habitat and Habits. All four males were found in the same limited area—a brook in woods on the left bank of the Rio Reventazón near the bridge crossing that river. In June the associated species of Odonata were *Hetaerina sempronia*, *Cora chirripa*, *Palaemnema distadens*, *Thaumatoneura inopinata* (females) and *Argia variabilis*. On July 28, the same species of *Hetaerina* and *Palaemnema* were there, while a *Heteragrion*, a *Philogenia* and an *Epigomphus* were seen but not taken. On the sunny morning of May 1, 1910, between 10 a.m. and 1 p.m., when the two tenerals and their exuviae were found, a male each of *Cora chirripa*, *Philogenia carrillica* and an *Argia* (*medullaris?*) were taken at the same spot, which was above a waterfall of about 30 feet in height. Much of the stream above the fall was subterranean, the visible water not covering the stones of its bed, and it was in this part that the transforming *Palaemnemae* were found. Mrs. Calvert found *P. distadens* transforming in a similar situation below the nearer waterfall west of Juan Viñas station, August 2, 1909, and there too were our transforming Philogenias found. It would seem that the larvae of these two genera are peculiar to this sort of habitat. The woods around the stream inhabited by *P. reventazoni* were very thick, dark and shady.

Palaemnema nathalia Selys (Pl. XIV, figs. 64A, B, E, L, M, apps. ♂, genitalia ♂; Pl. XV, figs. 64A′–C′, F, G, apps. ♂; Pl. XXI, figs. 94, 95, thoracic pattern.)

1886. *Palaemnema nathalia* Selys, Mem. couron. Acad. roy. Belg., Classe sci., XXXVIII, p. 147. (Panama; ♂ ♀.)

1903. *Palaemnema nathalia* Calvert, Biol. Centr.-Amer., Neur., pp. 134, 136, pl. 5, fig. 41 (apps. ♂). (Panama, Venezuela: Maento.)

1915. *Palaemnema nathalia* Williamson, Proc. U. S. Nat. Mus., XLVIII, p. 609. (Guatemala: Gualan; ♂ ♀.)

1917. *Palaemnema nathalia* A. S. & P. P. Calvert, A Year of Costa Rican Nat. Hist., pp. 275, 395. (Costa Rica: Guapiles, Rio Surubres.)

1918. *Palaemnema nathalia* Ris, Archiv. f. Naturgesch., 82 Jahrg., Abt. A, 9 Heft, pp. 92, 96, fig. 51 (apps. ♂). (Costa Rica: Tuis, Turrialba; ♂.)

Material examined. PANAMA: The type male, labeled "Pal. nathalia H. ♂," in de Selys' hand; a male labeled "dessiné par Biesemann pour Calvert" in M. G. Severin's hand, the original of our present figs. 64A, B, Pl. XIV; also 2♂, 3♀; all seven labeled "Panama" in de Selys' hand, on green paper, and one of the ♀♀ labeled also "Pal. nathalia S ♀" in his hand; there is a record also of another specimen, sex not given, "No. 77 bei Förster," not returned; all the preceding in the Brussels Museum. Panama, 1♂, 1♀, with green paper labels "Panama" in de Selys' hand, white paper printed labels "From E. de Selys' Coll.," "Coll. P. P. Calvert," now in coll. Acad. Nat. Sci. Philad.; these were given by de Selys to the writer in 1896 and are the pair cited by the latter in 1903, the ♂ being the original of the *Biologia* figure. Panama, Higgins collector, 1♂ in coll. E. B. Williamson. Panama: Boquete, 4200′, May 18, F. M. Gaige collector, 1 teneral ♂, Mus. Zool. Univ. Mich.; Alhajuelo, Canal Zone, May 29, 1912, August Busck collector, 2♀ in coll. U. S. Nat. Mus.

COSTA RICA: Rio Guapiles north of the town of that name, 980 feet (300 meters), June 5, 1909, 18♂, 5♀; Alajuela, 3100 ft. (945 m.), Rio Brazil, September 3, 1909, 1♂; Turrúcares, Rio Siquiares, 2200 ft. (670 m.), August 14 & 15, 1909, 4♂; Bonnefil Farm, Rio Surubres, 700 ft. (213 m.), October 17, 1909, 1♂, also 1♀, which, however, may not be conspecific; P. P. Calvert collector; in the writer's collection. Tuis, Turrialba, 1913, O. Garlepp collector, 1♂ in coll. F. Ris.

GUATEMALA: Gualan, in Dept. Zacapa, 420 ft. (128 m.), June 13 & 16, 1909, 1♂, 1♀, E. B. Williamson collector, in his coll.

The following are notes made at Brussels in August, 1929, on the first two males from Panama of the preceding list, viz.: the type of de Selys and the male here figured on Pl. XIV, figs. 64A, B, Pl. XXI, fig. 94.

♂. Pronotum blue, mid lobe with two mid-dorsal brown spots, the anterior triangular and smaller, the posterior transverse, hind lobe with a mid-dorsal black spot which is wider than the lateral blue. Propleuron blue.

Blue antehumeral stripe .26–.33 mm. wide at midheight, the humeral black in the type a mere line at that level, widening toward both ends. Mesinfraepisternum chiefly blue, or with a distinct blue spot at the postero-inferior angle. No black on the obsolete first lateral thoracic (interpleural) suture. No black or brown on the metasternum.

Tergite of abdominal segment eight blue, no black markings; of nine blue, an inferior black stripe each side for the entire length of the segment; of ten blackish.

Wings barely tinted with pale brown at apex.

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth at .38–.4 of the appendage-length, apex of the appendage rounded, not excised.

Basal tooth of the inferiors .09–.133 mm. long, apex of the superiors .244–.266 mm. wide.

Dimensions. Abdomen, 35.5. Hind wing, 23.5–24. Stigma: front wing, costal margin .91 mm.

The *living colors* of the male from Bonnefil Farm, Costa Rica, were noted as follows: Following pale bright blue: labrum, genae, sides of prothorax, most of sides of thorax, tergites of eighth and ninth abdominal segments. Eyes dark brown above, pale green below. Sides of abdominal segments one and two and basal, mid-dorsally-interrupted ring on three to seven, as well as metepimeron, are pale green rather than blue.

Succeeding are notes on the material in general in so far as they are different from, or supplemental to, those given above.

♂. Lateral extremities of the transverse occipital carina rounded in the great majority, but subangulate or angulate in five males, Guapiles, one male, Turrúcares. Nasus varying, perhaps with age, from blue, narrowly black at base, to black, anterior margin narrowly blue at middle, more widely at each side.

Blue antehumeral stripe .22–.37 mm. wide at midheight (narrowing greatly at its upper end in the Alajuela ♂), black humeral varying from a mere line (Turrúcares, 1♂) to .15 mm. (Rio Guapiles, Alajuela) and even .18 mm. (Panama, 1♂) in width at midheight, without apparent correlation with locality. A small black spot, .07–.22 mm. long, is present on the upper end of the obsolete interpleural suture in five males (Rio Guapiles, 2, Alajuela, 1, Bonnefil Farm, 1, Panama, 1). A teneral male (Rio Guapiles) has the entire mesepimeron brown.

Only four males from Guapiles have no black markings on the sides of eight inferiorly; all others from that locality and from elsewhere in Costa Rica and at least one from "Panama" have such black on at least the posterior half of the segment. All but one of the Guapiles males have a pair of blue spots on the dorsum of ten; the remaining individuals lack these spots.

The superior appendages and the genitalia of the second abdominal segment of one of the males from the Rio Guapiles were compared with those of the type and of the second (paratypical) male listed above as in the Brussels Museum and found to agree therewith, except that no attempt was made to relax the penis in the latter two; however, de Selys' paratype, now in the coll. Acad. Nat. Sci. Phila., also agrees in these features,

including the penis. The only males showing an angulation of the ventral margin of the superior appendages are one from Turrúcares, in which it is slight, but distinct, and that from Tuis described and figured by Dr. Ris (1918), which I also have examined, in which the angle is well marked. The male from Tuis is small (abd. 33, hind wing 23 mm.) and has fewer postnodals than any other in the material examined (19 f. w., 17, 18 h. w.); its smallness is equaled (Turrúcares) or exceeded (Bonnefil Farm), however, by individuals apparently typical and I see no good reason to think that either it or the Turrúcares male with the angulated margin is entitled to separate specific rank. The position of the superior tooth of the superior appendages varies from .27–.39 of the appendage-length (Rio Guapiles), .36 (Alajuela), .36–.38 (Turrúcares), .35 (Bonnefil Farm). The apex of the same appendage, while not or barely excised in any example, tends to be obliquely truncated (Guapiles, 12, Turrúcares, 4, Panama, 1, Gualan, 1) or rounded (Guapiles, 6, Alajuela, 1, Bonnefil F., 1, Tuis, *teste fig. Ris*, Panama, 1), when the appendage is seen in supero-internal view; a profile may give a different impression; compare our figures 64B, Pl. XIV, 64B′, C′, Pl. XV, and Dr. Ris's fig. 51.

The basal tooth of the inferior appendages varies in length, but seems never to exceed one-half the width of the apex of the superiors and to be usually shorter than one-half of that width. The apex of the inferiors is bent mesad on itself to form a hook, and here, on the mesal surface, is a low, convex enlargement *v*; distad of this enlargement the appendage is rapidly constricted to form the tip which is directed more or less vertically dorsad as a thin lamella which terminates acutely in posterior view, but in a mesal view is broadly rounded at tip, Pl. XV, figs. 64F, G.

♀. Differences from the male in addition to those indicated in the key, page 31: Lateral extremities of the transverse occipital carina angular, subangular or rounded in almost equal numbers and without correlation with locality. Nasus pale blue, a black line at base and a brown spot each side touching the black basal line (Bonnefil F.); blackish brown at base reaching to apical margin, leaving a small pale blue area each side (Guapiles, Alhajuelo); brown or black, pale at extreme ends (Gualan, Panama, 1 ♀); these differences are possibly due to age.

Blue antehumeral stripe from .25–.96 mm. wide at mid-height, but not distinguishable in some, in others interrupted in the middle third. Black humeral a mere line or absent, no black on the obsolete interpleural suture, mesepimeron violaceous or pale violaceous brown, dark stripe on the metapleural suture .15–.37 mm. wide, mesinfraepisternum pale brown or violaceous, pale blue at the infero-posterior angle.

Abdominal segment nine with the pair of large blue dorsal spots confluent at base (Guapiles, 1, Alhajuelo, 1), not confluent in the remainder. Dorsum of ten brown, usually paler each side at base.

Venation. ♂ ♀. Postnodals: front wings, Guapiles ♂, 20–26 (23 most frequent, 33.3%), ♀, 20–26 (26, 33.3%); Alajuela ♂, 26, 27; Turrúcares ♂, 21–25 (22, 62.5%); Bonnefil F. ♂, 21, 20, ♀, 18; Gualan ♂, 22, 23, ♀, 22; Panama ♂ ♀, 21–22 (*teste Selys*). Postnodals: hind wings, Guapiles ♂, 19–23 (21, 36%), ♀, 18–23 (21, 25%); Alajuela ♂, 22; Turrúcares ♂, 19–22 (19, 37.5%); Bonnefil F. ♂, 19, ♀, 17; Gualan ♂, 19, ♀, 20, 21; Panama (1♂, 1♀, *ex coll. Selysi*) ♂, 18, 19, ♀, 19.

Postnodal at which the nodal sector arises: front wings, Guapiles ♂, 7th–10th (8th, 69%), ♀, 8th–9th (9th, 67%); Alajuela ♂, 9th, betw. 8th & 9th; Turrúcares ♂, 7th–9th (8th, 62.5%); Bonnefil Farm ♂, 9th, 8th, ♀, 7th; Gualan ♂, 8th, 9th, ♀, 8th; Panama (1♂, 1♀) ♂, 9th, 8th, ♀, 8th. Id., hind wings, Guapiles ♂, between 5th & 6th–7th (7th, 50%, 6th, 47%), ♀, 6th–7th (7th, 58%); Alajuela ♂, 8th; Turrúcares ♂, 5th–7th (6th, 50%); Bonnefil Farm ♂, 7th, ♀, 5th; Gualan ♂, 6th, ♀, 7th; Panama ♂, 6th, ♀, 6th, 7th.

Postnodal at which the ultranodal sector arises: front wing, Guapiles ♂, 9th–12th (10th, 61%), ♀, 10th–12th (10th, 43%); Alajuela ♂, 11th, 12th; Turrúcares ♂, 9th–11th (10th, 62.5%); Bonnefil Farm ♂, 11th, ♀, 9th, 8th; Gualan ♂, 10th, 11th, ♀, 10th; Panama ♂, betw. 9th & 10th, 10th, ♀, 10th, 11th. Id., hind wings, Guapiles ♂, 7th–11th (9th, 56%), ♀, 8th–10th (9th, 75%); Alajuela ♂, 10th; Turrúcares ♂, 8th–10th (9th, 50%); Bonnefil Farm ♂, 9th, ♀, 7th; Gualan ♂, 8th, ♀, 9th; Panama ♂, 9th, 8th, ♀, 10th. Cells behind the median vein, proximal to the stigma, at which the ultranodal arises: front wings, Guapiles ♂, 9–13 (11, 47%), ♀, 9–13 (10, 42%); Turrúcares ♂, 9–11 (10, 50%). Id., hind wings, Guapiles ♂, 9–12 (11, 53%), ♀, 9–12 (10, 42%); Turrúcares ♂, 8–11 (10, 50%).

In all specimens examined, with the exception of the right

front wing of the female from Bonnefil Farm,[66] the upper sector of the triangle ends distad of the level of origin of the ultranodal sector, on both front and hind wings; the variations are, therefore, given for the following two lots only: Cells behind the ultranodal at whose level the upper sector of the triangle ends: front wings, Guapiles ♂, 2–6 (3, 28%) (3–11 marginal cells, 9 most frequent, 22%), ♀, 2–8 (5, 25%) (3–12 m. c.); Turrúcares ♂, 2–5 (3, 25%) (3–7½ m. c., 4, 37.5%). Id., hind wings, Guapiles ♂, 3–9 (6, 31%) (4–15 m. c., 10, 22%), ♀, 5–8 (7, 50%) (8–15 m. c., 11, 33.3%); Turrúcares ♂, 6–6½ (6, 87.5%) (8–10½ m. c., 9 & 10 each 37.5%).

Cells surmounted by the stigma: front wings, Guapiles ♂, less than 2–3 (more than 2, 42%), ♀, less than 2–more than 2 (less than 2, 50%); Alajuela ♂, less than 2 & 2; Turrúcares ♂, more than 1–more than 2 (less than 2 & 2, each 37.5%); Bonnefil Farm ♂ ♀, less than 2; Gualan ♂, more than 2, 2, ♀, less than 2, more than 2; Panama ♂ ♀, more than 1. Id., hind wings, Guapiles ♂, less than 2–3 (2, 42%), ♀, less than 2–more than 2 (less than 2, 42%); Alajuela ♂, less than 2; Turrúcares ♂, 1–more than 2 (less than 2, 50%); Bonnefil Farm ♂, less than 2, 2, ♀, less than 2; Gualan ♂, more than 2, 2, ♀, less than 2; Panama ♂, more than 1, ♀, 2, less than 2. These data, especially those for single males and females (Alajuela, Bonnefil Farm, Gualan, Panama), show that number of cells surmounted by the stigma cannot be employed as a specific character, although the range may be of some value. In this connection, the following measurements from one male ("q") from Guapiles are of interest:

	Length of Posterior Margin of Stigma	Number of Cells Surmounted
Right front wing	1.26 mm.	1.86
Left front wing	1.26 "	1.67
Right hind wing	1.33 "	2.4
Left hind wing	1.33 "	2.4

It is obvious that it is the cells that vary in size and that cells under the same stigma are not equal in size to each other.

Dimensions. Abdomen: Guapiles ♂, 34–38, ♀, 30–34.5; Alajuela ♂, 32.5; Turrúcares ♂, 33.5–35; Bonnefil Farm ♂, 30, ♀, 28.5; Gualan ♂, 32.5, ♀, 30; Panama ♂, 34, ♀, 31; Alhajuelo ♀, 27.5. Hind wing: Guapiles ♂, 24–27, ♀, 24.5–26.5; Alajuela ♂, 24; Turrúcares ♂, 23–25; Bonnefil Farm ♂, 20.5, ♀, 22.5;

[66] In this wing the upper sector ends exactly *at* the level of origin of the ultranodal.

Gualan ♂ ♀, 24.5; Panama ♂ ♀, 23; Alhajuelo ♀, 22. Stigma: front wing, costal margin, Guapiles ♂, .9–1.11, ♀, .9–1.04; Alajuela ♂, .74; Turrúcares ♂, .86–.96; Bonnefil Farm ♂, .9, ♀, .98; Gualan ♂, .98, ♀, 1.10; Panama ♂, .9, ♀, 1.0; Alhajuelo ♀, .98 mm.

Habitats and Habits. P. nathalia was collected with *P. paulirica* at the Rio Guapiles and at Tuis, Turrialba; under that species, *anteà*, pages 34–35, will be found remarks on these two localities. The male of *nathalia* from Alajuela was taken in dark woods in a little ravine occupied by the Rio Brazil, not far from its junction with the Rio Ciruelas. In the same woods along the Brazil were *Hetaerina capitalis*, *Heteragrion erythrogastrum* and *Argia medullaris*. The Rio Siquiares, to the north of the railroad station of Turrúcares, is a swift-flowing stream, with a rocky bed in the form of steps so that the descent of the flowing water is well marked. It was shaded with medium-sized and small trees, mixed with much bull's horn thorn (*Acacia costaricensis*). The associates of *nathalia* here were *Hetaerina macropus*, *Cora marina*, *Heteragrion erythrogastrum*, *Palaemnema distadens* and *Argia* sp. The two *nathaliae* from Bonnefil Farm were taken in the ravine of the Rio Surubres having steep sides and possessing many tall forest trees, as well as *Enterolobium* ("guanacaste"), palms, cacao, *Acacia*, *Cecropia*, *Begonia* and *Selaginella;* an associated Odonate was *Philogenia terraba;* dried eggs are projecting from the genital valves of the female *nathalia* from Bonnefil Farm.

Remarks. In the present state of our knowledge, *nathalia* is the most widely distributed species of its genus, extending from Gualan, Guatemala, to Maento, Venezuela, a range of six degrees in latitude and nearly twenty in longitude, attaining an altitude of 4200 feet (1280 meters) in Panama and, in Costa Rica at least, occurring on both the Atlantic and Pacific slopes. The recorded places where it has been observed are far apart, so that its widely scattered distribution makes it desirable to give details of specimens from different localities as we have done above.

Palaemnema clementia Selys (Pl. II, figs. 40, 41, rear of head, prothorax ♀; Pl. XV, figs. 65A–N, apps. ♂, penis; Pl. XXI, figs. 96–98, thoracic pattern.)

1886. *Palaemnema clementia* Selys, Mem. couron. Acad. roy. Belg., Classe sci., XXXVIII, p. 148. (Venezuela: S. Esteban; ♂.)

1909. *Palaemnema clementia* Calvert, Ann. Carnegie Mus, Pittsburgh, VI, p. 211. (Colombia: Bonda; ♂.)

Material examined. COLOMBIA: Bonda (250 ft. = 76 m.), Dept. Magdalena, July, H. H. Smith collector, 1 ♂, in coll. Carnegie Mus. Pittsb.; [this is the male cited by the present writer in 1909]. Cristalina, 1050 ft. (320 m.), February 13, 1917, J. H. and E. B. Williamson collectors, 1 ♀.

VENEZUELA: Macuto, January 30, 1 ♂; San Esteban, Carabobo, February 4, 1 ♂, February 5, 1 ♀; Boqueron, March 21, 1 ♀; La Fria, April 14–18, 61 ♂, 14 ♀; Tachira, April 4, 5, 8, 9, 6 ♂, 1 ♀; all in 1920, J. H. and E. B. Williamson and W. H. Ditzler collectors, in coll. E. B. Williamson.

This is another of de Selys' species the type of which appears to be lost. His colored drawings are preserved at the Museum at Brussels, are dated in his handwriting "Halloy 7 Oct. 1884." and specify "S. Esteban (Venezuela)" as the locality. The following description was made from these drawings:*

♂. Pronotum blue, a mid-dorsal black spot on the hind lobe for its entire length, a mid-dorsal, triangular, black spot on the anterior half of the mid lobe, a black transverse line between mid and fore lobes, fore lobe otherwise entirely blue. Propleuron blue (dorsal view only is shown in the drawing).

Blue antehumeral stripe for almost the entire length of the mesepisternum, at midheight about half as wide as the black humeral. Mesinfraepisternum apparently black superiorly, pale yellow inferiorly. A separate black stripe, a little narrower than the blue antehumeral, occupying the upper .4 of the obsolete first lateral thoracic (interpleural) suture.

Tergite of abdominal segment eight blue, more obscure than in the drawing of *P. melanostigma*, inferior margin very narrowly black for its entire length; of nine obscure blue, a black line inferiorly on each side for the entire length of the segment; of ten blackish brown.

* I compared these drawings with three males from La Fria, April 16 and 17, especially one male of April 16 which has the *separate* black stripe on the interpleural suture. The agreement was close, the only differences being as follows: The drawings show no mid-dorsal black spot on the fore pronotal lobe or on the posterior half of the mid lobe, no black marking at the postero-inferior angle of the metepimeron (compare *anteà*, page 6,—none of de Selys' drawings of any species of *Palaemnema* show such), no mid-dorsal basal black on abdominal segment eight.

Apex of wings uncolored, almost three complete cells under the stigma. No details of the appendages shown. Abdomen 34, hind wing 25 mm. (*teste Selys*).

The material examined yields the following data supplemental to the preceding:

♂. Lateral extremities of the transverse occipital carina well-marked, angulate, subangulate, or, perhaps less commonly, rounded. Nasus chiefly blue, a narrow, transverse, basal (superior), black stripe, to basal half black.

Fore pronotal lobe blue with a mid-dorsal black dot, mid and hind lobes black with a blue lateral stripe confluent with the blue of the fore lobe and of the propleuron.

Blue antehumeral stripe narrowing upward, .16–.33 mm. wide at midheight. All transitions exist between a single black stripe (.24 mm. wide) on the humeral suture, or this stripe followed by a second, also black, on the upper part of the interpleural suture, and finally the mesepimeron entirely black. Mesinfraepisternum black, pale blue at postero-inferior angle. Metepimeron with a brown or black stripe, in some very faint, dorsal at its posterior end to the latero-ventral carina, crossing that carina to the metasternum and converging cephalad, with its fellow of the opposite side, almost to the third coxa. Many males have a well-marked blue spot on the lateral face of the third coxa; the black stripe on the dorsal surface of the femora is well-marked.

Tergites of abdominal segments eight and nine blue or violaceous, inferior margin each side narrowly black in the posterior half of eight and entire length of nine; an isolated, mid-dorsal, basal, black spot on eight.*

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth at .38–.48 of the appendage-length, tip of tooth acute, apex of appendage not excised. Basal tooth of the inferiors slender, spinelike, as long as one-half of the width of the apex of the superiors.†

♀. Differences from the male in addition to those indicated in the key, page 31: Nasus black or Van Dyke brown, a pale yellowish spot each side at anterior margin. The black of the prothorax and thorax of the male often replaced by dark brown, the blue of the prothorax is blue in some females, yellowish in others, while some lack both blue and yellow from the hind lobe. The mid-dorsal thoracic carina is black, remainder

* Mr. Williamson made the following note on the living colors of a teneral male of this species, taken at La Fria, April 16: "Sides of thorax white, blue antehumeral stripe and apical abdominal blue are brown(ish), scarcely distinguishable from adjacent brown areas."

† De Selys says indeed: "Pas de petite dent à la base interne supérieure des appendices inférieurs. Le bout des supérieurs . . . précédé en dessous d'une petite dent," neither of which statements applies to our material.

of the dorsum dark brown as far as the interpleural suture, with or without a small, inferior, pale blue, antehumeral spot. Stripe crossing from metepimeron to metasternum paler than in the male. On the envelope of the ♀ from Cristalina Mr. Williamson has the note: "♀ Palaemnema with apex abd. pale bluish spotted, not yellow like ♀ 2/12/17" (*P. croceicauda*).‡

♂ ♀. Apex of the wings smoky (less so in the ♀) in the costal and median cells from the distal end of the stigma. Postnodals: front wings, ♂ ♀, 18–23 (21 most frequent ♂, 19 ♀); hind wings, ♂, 17–22 (18), ♀, 16–21 (17). Postnodal at which the nodal sector arises: front wings, ♂ ♀, 7th–10th (8th); hind wing, ♂, 5th–7th (7th), ♀, 6th–7th (6th). Postnodal at which the ultranodal arises: front wings, ♂ ♀, 8th–12th (10th); hind wings, ♂ ♀, 7th–10th (9th & 8th nearly equally frequent); or, ultranodal arising at cells behind the median vein proximal to the stigma, front wings, ♂, 7–12 (9, 10), ♀, 7–10 (9); hind wings, ♂, 8–12 (10, 11), ♀, 7–11 (9). Upper sector of the triangle ending distad of the level of origin of the ultranodal in 92% front wings, ♂ ♀, by less than 1 to more than 3 cells in the area behind the ultranodal (1–6 marginal cells); in 100% hind wings, ♂ ♀, by 3–7 cells, etc. (5–11 m. c.); in the remaining 8% front wings, the end is at the level of origin. Cells surmounted by the stigma: front wings, more than 1 to 3 cells (less than 2); hind wings, more than 1 to more than 2 (less than 2). These data on the venation are based on a tabulation of 13 ♂, 12 ♀. Stigma in strong sunlight Cologne earth to Van Dyke brown of Smith's *Glossary of Entomology*.

Dimensions. Abdomen: ♂, 29–38; ♀, 29–32. Hind wing: ♂, 21–26; ♀, 22.5–26. Stigma, front wing, costal margin, ♂, .82–.98; ♀, .9–1.14 mm. The extremes of the range of size for the male are almost realized by two individuals taken at La Fria, April 18.

Habitats and Habits. Bonda, Colombia, is a "village on the river Manzanares, seven miles east of Santa Marta. . . . The country is hilly, covered in great part with dry forest with intervals of open grass land on the ridges. A thin line of mountain forest adjoins the river."[67]

‡ Among de Selys' papers at the Museum at Brussels is a MS. description of a female from Bogota, Colombia, which he referred to *clementia* "à publier." The description is dated "Liège 26 mars 1893" and presumably refers to the same specimen as that from R. Martin's collection from which he made colored drawings (likewise preserved at the Museum) at Liège 24 mars 1893. As this description was never published, and as it is not certain that this female really is *clementia*, it seems unnecessary to reproduce it here.

[67] H. H. Smith, Bull. Amer. Mus. Nat. Hist., xx, pp. 408–414, (1904), reprinted in part in Ann. Carnegie Mus. Pittsb., vi, pp. 74–76, (1909). [The male of *P. clementia* probably came from the mountain forest adjoining the river.]

Palaemnema brucei was also taken at Cristalina and under that species, *anteà*, page 77, we have quoted from Mr. Williamson's description of that locality. *P. melanostigma* also occurs in the vicinity of San Esteban, Venezuela (*anteà*, page 72), but was not associated with *clementia*, having been taken on different days and in different situations. From Dr. H. B. Baker's notes it appears that *clementia* was obtained along quebradas near the town at elevations of 250–1000 feet (76–300 meters). At La Fria (460 ft., 140 m.) and Tachira (1200 ft., 366 m.), *clementia* was found in the same localities as *P. mutans* (*anteà*, page 65).

The two remaining sources of *clementia* are thus described by Mr. Williamson:[68] "Macuto, Venezuela. About a mile and a half [2.4 km.] east of La Guiara. The Rio Macuto at Macuto is a clear, swift, rocky stream, about ten feet wide, flowing directly into the Caribbean Sea." "Boqueron, between kilometer posts 68 and 69 on the railroad above Tucacas, Venezuela. Elevation estimated as 375 feet, 114 m. Lies in a heavily wooded and flat or slightly rolling country . . . has many beautiful streams of diverse character. . . . There may be, at this season, little isolated pools of water or, more rarely, fine, clear quebradas, with low rapids and pools and frequent growths of *Cyclanthus bipartitus*. . . . Boqueron is a delightful region, but we found it most disappointing for collecting."

Palaemnema croceicauda new species (Pl. XVI, figs. 66A–E, G, K′, apps. ♂, penis; Pl. XVII, fig. 66F, inf. app. ♂; Pl. XXI, fig. 99, thoracic pattern.)

Material examined. COLOMBIA: Cristalina, 1050 feet (320 meters), February 12, 15 and 17, 1917, J. H. and E. B. Williamson collectors, 1 ♀, 1 ♂ and 3 ♀ on the respective days; in coll. E. B. Williamson.

Type. The male of February 15, here figured.

Paratypes. The four females.

♂. Following are Mr. Williamson's notes on the living colors of the male type: "Eyes black above, pale dull green beneath; thorax light clove brown—a soft, pretty shade; humeral and first lateral pale yellow, the former very narrow; below dull flesh. Abdomen brown at base, progressively darker till black on 7; 3–7 with pale dull flesh, narrowly interrupted, basal rings;

[68] Occas. Papers, Mus. Zool. Univ. Mich., no. 130, pp. 34, 25, (1923).

extreme base of 8 black; remainder of dorsum, including all of 9–10, brilliant chrome yellow."

From an examination of the dried specimen, I obtain these data: Lateral extremities of the transverse occipital carina rounded, sloping gently to the posterior surface of the head. Nasus pale reddish brown (a little paler than the burnt siena of Smith's *Glossary*), rhinarium yellow, labrum distinctly yellow, distal third reddish brown.

Pronotum pale greenish yellow, a short, pale brown, transverse streak near each lateral margin of the fore lobe; a geminate brown mark on mid lobe, wider than the greenish yellow of either side; hind lobe obscure reddish brown. Propleuron greenish yellow.

A narrow greenish yellow line bordering anteriorly the greater part of the length of the humeral suture, .08 mm. wide at mid-height. Entire mesepimeron rich maroon brown, .65 mm. wide at midheight. Mesinfraepisternum probably bluish in life. Thoracic dorsum with coppery reflections. No brown or black on the metasternum.

Tergites of abdominal segments eight to ten apparently orange; eight with a very narrow, transverse, basal, black ring which is confluent below on each side with an inferior, longitudinal, black stripe as long as the segment; a similar longitudinal stripe on nine to ten.

Superior appendages with the inferior margin barely angulate where the appendage enlarges, no superior tooth, apex feebly excised at middle. Basal tooth of the inferiors apparently represented by the end of a carina.

♀. Differences from the male: Distal half of labrum reddish brown in one female; a greenish or bluish tinge to the yellow of the rhinarium of 1 ♀; fore pronotal lobe with anterior margin obscure and in some a median dark spot; mesepimeral brown slightly narrower (.57 mm.).

♂ ♀. Wings uncolored. Postnodals: front wings, ♂, 16, ♀, 15–17 (16, 62.5%); hind wings, ♂, 13, 14, ♀, 14–15 (15, 75%). Postnodal at which nodal sector arises: front wings, ♂ ♀, 6th–7th (6th); hind wings, ♂ ♀, 5th–6th (5th). Postnodal at which ultranodal sector arises: front wings, ♂ ♀, 7th–8th (8th); hind wings, ♂ ♀, 7th–8th (7th); or, ultranodal arising at cells behind the median vein proximal to the stigma, front wings, ♂ ♀, 6–7 (7); hind wings, ♂ ♀, 6–8 (7). Upper sector of the triangle ending: front wings, ♂ ♀, *at* or *proximad* to the level of origin of the ultranodal, in the latter case by never more than one cell in the area behind the nodal sector (or more than two marginal

cells); hind wings, ♂ ♀, *distad* to that level by 1 to more than 2 cells behind the ultranodal (1 to more than 3 m. c.). Cells surmounted by the stigma, front wings, ♂ ♀, more than 1 to 2; hind wings, ♂, 2, ♀, more than 1 to more than 2.

Dimensions. Abdomen: ♂, 31; ♀, 27–31. Hind wing: ♂, 20; ♀, 21–24. Stigma, front wing, costal margin, ♂, .9, ♀, .86–.98; hind margin, ♂, 1.06, ♀, 1.02–1.35 mm.

Habitats and Habits. Under *P. brucei, anteà*, page 77, quotation has been made from Mr. Williamson's general account of Cristalina, where *P. croceicauda* also was taken. In connection with his description of the living colors of the latter, reproduced above, he mentions that the type male was "sitting in dense brush along right tributary of Quebrada Sabaleticus." Referring to the Sabaleticus, he writes:[69] "This quebrada, in the forest, was a wonderfully fine stream six to twelve feet wide with frequent long pools and rapids. The firm footing, the beautiful and varied scenery, and the rich fauna made collecting here almost ideal. . . . Following the Sabaleticus up stream one and a half or two miles from where it emerges from the forest into the brushy pasture we came to a waterfall between four and five feet high—the highest waterfall we discovered on this quebrada. About a quarter of a mile above this waterfall a very small tributary from the right enters the quebrada. We followed this tributary to its source in the hills. About a half mile back from its mouth, standing at an angle of 60°–90°, is a broken rock face over which water dripped. Here and here only we found Mesagrion. . . ." Not far, presumably, from the *Mesagrion* rock, the type of *Palaemnema croceicauda* was taken. The female of *croceicauda* captured on February 12 is enclosed in the same envelope with a male of *P. brucei* and with this note: "♀ similar but paler, but apex of abd. bright shining yellow. Places similar to a Heter[agrion] but wings folded in repose."

Comparison. *P. croceicauda* closely resembles *P. edmondi*, also taken at Cristalina, although on a different day (February 16). In addition to the differences between the two species given in the key, *anteà*, page 30, *croceicauda* not only shows slight distinctions in the colors of the labrum, rhinarium, nasus and

[69] Univ. Mich. Mus. Zool. Miscel. Publ., no. 3, p. 17, (1918).

thoracic dorsum, as may be seen by comparing the descriptions of the two, but also has the terminal curved portion of the inferior appendages more slender, the dilated terminations of the penis filaments more elongated, while its dimensions are a little smaller.

Palaemnema edmondi new species (Pl. XVI, figs. 67A–E, G, K′, apps. ♂, penis; Pl. XVII, fig. 67F, inf. app. ♂; Pl. XXI, fig. 100, thoracic pattern.)

Material examined. Colombia: Cristalina, 1050 feet (320 meters), February 16, 1917, J. H. and E. B. Williamson collectors, 3♂; in coll. E. B. Williamson.

Type. Male here figured.

Paratypes. The other two males.

♂. (Description based on the dried specimens.) Lateral extremities of the transverse occipital carina rounded, lower than in *P. croceicauda.* Nasus black, a minute pale blue spot each side, rhinarium pale blue, labrum pale blue, its distal third black.

Pronotum black, a blue spot on each side of the fore and mid lobes, all four spots practically confluent with each other, hind lobe unspotted. Propleuron pale blue.

No pale antehumeral or humeral line or stripe. Entire, or almost the entire, mesepimeron rich maroon brown. Mesinfraepisternum mostly blue. Thoracic dorsum with metallic green reflections. No brown or black on the metasternum.

Tergites of abdominal segments eight to ten blue, an inferior, longitudinal, black stripe each side for the entire length of each segment, eight also with a transverse black stripe on the basal seventh or less, confluent below with the longitudinal stripe.

Wings uncolored. Postnodals: front wings, 12, 13 or 15 (13 most frequent, 50%); hind wings, 12 and 13 equally frequent. Postnodal at which the nodal sector arises: front wings, 6th or 7th (6th); hind wings, 5th or betw. 4th & 5th (5th). Postnodal at which ultranodal sector arises: front wings, 7th–9th (8th, 50%); hind wings, 6th–7th (7th, 50%); or, ultranodal arising at cells behind the median vein proximal to the stigma, front wings, 5–7 (5, 50%); hind wings, 6–7 (6, 67%). Upper sector of the triangle ending: front wings, *at or proximad to* the level of origin of the ultranodal, in the latter case by not more than two cells in the area behind the nodal sector (or more than 4 marginal cells); hind wings, *distad to* that level by 1–3 cells in the area behind the ultranodal (more than 1 to more than 4 m. c.). Cells surmounted by the stigma: front wings, 1–2; hind wings, 1–2 (2).

Superior appendages with the inferior margin not angulate where the appendage enlarges, a superior tooth at .45–.5 of the appendage-length, tip of tooth rounded, not acute, apex of the

appendage not excised. Basal tooth of the inferiors a blunt tubercle. ♀ unknown.

Dimensions. Abdomen, 33–34. Hind wing, 21–22. Stigma, front wing, costal margin 1.02–1.10; hind margin 1.23–1.31 mm.

Habitat and Habits. This species was taken on the same day as *P. brucei*, to which reference may be made (*antea*, page 77) for a description of the locality, and to the key, pages 27 and 30, for the differences which separate it from that species. The nearest ally of *P. edmondi* is *P. croceicauda*, under which, page 98, is given a comparison of the two species.

The specific name is in memory of the Baron Edmond de Selys-Longchamps, to whom the generic name *Palaemnema* is due.

Palaemnema chiriquita new species (Pl. XVI, figs. 68E, E′, L, M, genitalia ♂; Pl. XVII, figs. 68A–C, F–H, apps. ♂; Pl. XXI, fig. 101, thoracic pattern.)

Material examined. COSTA RICA: Peralta, Rio Chiriqui trail, August 10, 1909, P. P. Calvert collector, 2♂.

Type. One of the above mentioned males, here figured, to be deposited in the collection of the Academy of Natural Sciences of Philadelphia.

Paratype. The other male.

♂. Lateral extremities of the transverse occipital carina not prominent, angulate. Nasus metallic blue black, except at the extreme lateral ends which are pale blue, confluent with the pale blue of the rhinarium; rhinarium and most of the labrum pale blue.

Pronotum: fore lobe blue, mid lobe black, an anterior, mid-dorsal spot and a spot each side blue, hind lobe black. Propleuron pale blue.

No pale antehumeral or humeral stripe, mesepisterna metallic greenish black. Anterior third or fourth of the mesinfraepisternum blackish brown, remainder pale blue. Mesepimeron blackish, except at its hind margin; dark stripe on the metapleural suture .3–.37 mm. wide; no dark markings on the pectus behind the third coxae.

Tergites of abdominal segments eight and nine blue, eight with the basal, mid-dorsal sixth and an inferior spot on the posterior third or fifth black, nine with an inferior, longitudinal black stripe each side as long as the segment; ten black with a pair of transversely elongated bluish spots.

Wings faintly smoky at tips or uncolored. Postnodals: front wings, 14–15 (15 more frequent); hind wings, 13–15 (13, 50%). Postnodal at which the nodal sector arises: front wings, between

5th & 6th or at 6th (6th, 75%); hind wings, 5th. Postnodal at which the ultranodal sector arises: front wings, 7th or 8th (7th, 75%); hind wings, 7th & 8th equally frequent; or, ultranodal arising at cells behind the median vein proximal to the stigma, front wings, 6–7 (7, 75%); hind wings, 5–6 (5, 75%). Upper sector of the triangle ending: front wings, *at or proximad to* the level of origin of the ultranodal, in the latter case by not more than one cell behind the nodal or not more than 2½ marginal cells; hind wings, *distad* in the type by 1 cell behind the ultranodal (1 m. c.), *proximad* in the paratype by 1 cell behind the nodal (1–2 m. c.). Cells surmounted by the stigma: front & hind wings, more than 1 to less than 2 (more than 1, 75%).

Superior appendages 1 mm. long, with the inferior margin not angulated where the appendage enlarges, superior tooth at .43 of the appendage-length, apex of the appendage excised at 90°, the superior margin prolonged as an overhanging process shaped like the quadrant of a circle. Basal tooth of the inferiors shorter than half the width of the apex of the superiors.

♀. Unknown.

Dimensions. Abdomen, 33–34.5. Hind wing, 21–22. Stigma, front wing, costal margin .82–.9; hind margin 1.08–1.10 mm.

Habitat and Habits. The Rio Chiriqui empties into the Rio Reventazón near mile-post 53¼ from Limón and north of the railroad station of Peralta. At the time of my visit its banks were heaped with rounded boulders. A trail left the railroad at the north (left) bank and after a short distance entered woods. The principal characteristic of this piece of forest seemed to be the great number of lianas which hung from the trees. They were of all sizes from those little thicker than light twine to a great cable as thick as a man's body and composed of several smaller lianas, each as thick as one's wrist, wound around each other. The trail broadened to be ten feet or more in width, was much cut up with horses' hoofs and in places extremely soft and muddy. It crossed several small streams which are not affluents of the Chiriqui but flow in an opposite direction. I turned back at a little hill, whose altitude by my aneroid was 1400 feet (427 meters); Peralta station is at 322 meters. Although not associated with *P. gigantula*, *P. chiriquita* was not far removed either in space or in time from that species.

Comparison. The closest ally of *P. chiriquita* is *P. melanota* Ris. The key, *anteà*, pages 30, 31, gives such distinctions as I have found between them.

Palaemnema melanota Ris (Pl. XVII, figs. 69A–G, apps. ♂, penis; Pl. XXI, fig. 102, thoracic pattern.)

1918. *Palaemnema melanota* Ris, Arch. f. Naturgesch., 82. Jahrg., Abt. A, Heft 9, pp. 92, 99, fig. 53 (apps. ♂). (Tuis, Turrialba, Costa Rica. Only the type ♂.)

Material examined. Costa Rica: Tuis, Turrialba, 1000 m., 1913, Garlepp collector, the type male in coll. Ris. Rio Guapiles, north of the town of that name, June 5, 1909, P. P. Calvert collector, 2 ♀, one of them in alcohol.

♂. Lateral extremities of the transverse occipital carina subangulate or rounded, not prominent. Nasus shining black.

Pronotum: fore lobe pale blue, mid lobe dark brown with a circular blue spot each side half as wide as the mid-dorsal brown; hind lobe black. Propleuron blue.

No pale antehumeral or humeral stripes, mesepisterna and anterior half of mesepimera black with blue and green reflections, mesinfraepisternum pale blue. Brown stripe on the second lateral thoracic (metapleural) suture .25 mm. wide, no dark markings on the metasternum.

Of abdominal segments eight to ten Dr. Ris wrote in his description of 1918: "8–10 ganz schwarz (nicht ganz sicher, Färbung hier nicht gut erhalten)." See the remarks on this subject in the footnote, *anteà*, page 31.

Wings uncolored. Postnodals: front wings, 15, 16; hind wings, 16, 17. Nodal sector arising: front wings, at the 7th postnodal; hind wings, at the 6th. Ultranodal sector arising: on the front wings, at the 8th or 9th postnodal; hind wings, at the 8th; or, at cells behind the median vein proximal to the stigma, front wings, 7; hind wings, 7 or 6. Upper sector of the triangle ending: right front wing, *proximad to* the level of origin of the ultranodal by less than one cell in the area behind the nodal (1 marginal cell); left front wing, *distad to* that level by less than one cell behind the ultranodal (less than 1 m. c.); hind wings, *distad to* the same level by 3 cells, etc. (5–4 m. c.). More than one cell surmounted by the stigma on all wings.

Superior appendages with the inferior margin not angulated where the appendage enlarges, superior tooth at .56 of the appendage-length, apex of the appendage excised inferiorly as shown in Pl. XVII, fig. 69B. Basal tooth of the inferiors represented by a blunt or triangular tubercle.

♀. Differences from the male in addition to those indicated in the key, page 31.

Nasus black (or dark blackish brown at base, reddish brown anteriorly), a minute pale blue or yellow spot at each extreme side. Propleuron pale blue or yellow. Mesinfraepisternum brown, posterior and inferior margins pale blue or yellow. Post-

nodals: front wings, 15–17; hind wings, 13–15. Nodal sector arising: front wings, at 7th or 6th postnodal; hind wings, at 6th or 5th. Ultranodal sector arising: front wings, at 9th or 7th postnodal; hind wings, at 8th or 7th; or, at cells behind the median vein proximal to the stigma, front wings, 6–8; hind wings, 5–7. Upper sector of triangle ending: front wings, *at or proximad to* the level of origin of the ultranodal, in the latter case by $\frac{1}{2}$–2 cells in the area behind the nodal sector (1–3 marginal cells); hind wings, *distad to* that level by $1\frac{1}{2}$ to more than 2 cells, etc. ($1\frac{1}{2}$–3 m. c.). Cells surmounted by the stigma: front wings, less than 2 to more than 2; hind wings, more than 1 to less than 2.

Dimensions. Abdomen: ♂, 39; ♀, 35. Hind wing: ♂, 25; ♀, 24.5–25.5. Stigma, front wing, costal margin, ♂, 1.02, ♀, 1.14–1.23; hind margin, ♂, 1.27, ♀, 1.39–1.43 mm.

Habitats and Habits. Both sexes of this species have been taken only at localities inhabited also by *P. paulirica* and *P. nathalia;* under the former of these will be found the available information concerning the habitats.

Comparisons. Thanks to the kindness of Dr. Ris, I have had the opportunity of studying at my home both his type and the additional specimen which he had before him when writing his description. For a time I was disposed to consider the Costa Rican specimens here described as *P. chiriquita* as conspecific with *melanota;* the distinctions given in the key, *anteà,* pages 30, 31, however, appear to justify the separation. The second male of Dr. Ris' description, "als zugehörig etwas zweifelhaft," I carefully relaxed and found the following differences from the type: abdominal segment 8 apparently blue, with an inferior, longitudinal, dark brown stripe each side in the posterior two-thirds of the segment; 9 doubtful, 10 apparently black. Superior appendages with the inferior margin angulated where the appendage enlarges, superior tooth at .38 of the appendage-length, apex of the appendage not at all excised but convex throughout. Upper sector of the triangle ending distad of the level of origin of the ultranodal on all four wings. Pterostigma smaller, costal margin (f. w.) .82, hind margin 1.23 mm. Owing to the decidedly teneral condition of the specimen, I was not able to make a satisfactory examination of the inferior appendages or of the penis filaments. I am inclined to refer this second male to *P. paulirica* (*anteà,* page 32).

The females were, at the time of collecting, confused with *nathalia;* only when their venation was studied was their distinctiveness from *nathalia* perceived; the absence of a lateral projection on the fore pronotal lobe is another differential.

Explanation of Plates

Except where otherwise stated, the figures have been drawn with the aid of a camera lucida and compound microscope by the author.

Plate I

Variations in Family and Generic Venational Characters found in *Palaemnema*.

Most of the figures are drawn from the *under* side of the wings and hence appear reversed as to their right- or left-sidedness; rf right front, rh right hind, lf left front, lh left hind wings, respectively.

Figs. 3–10 and 30. Three antenodal cross-veins: 1, first or proximal, and 2, second or distal, normal antenodals; 3, additional or abnormal antenodal. All figures from *P. paulirica*, Guapiles, Costa Rica.

Figs. 3, 4, 30. Third antenodal proximal to the first and costal only; rudimentary in fig. 4 (♂ *i*, lh); complete in fig. 3, ♂ *k*, rf, and fig. 30, ♂ *i*, rh.

Figs. 5, 6. Third antenodal proximal to the first; subcostal only, fig. 5, ♂ *e*, rh, costal and subcostal, fig. 6, ♂ *l*, rf.

Figs. 7–10. Third antenodal between the two normal, nearly mid-way, figs. 7–9; both costal and subcostal (7, ♂ *g*, lh), costal only (8, ♂ *g*, rf), subcostal only (9, ♂ *k*, rh); nearer to the second and subcostal only (10, ♂ *p*, rh).

Fig. 11. One cross-vein in the quadrilateral. *P. reventazoni*, Reventazón valley, Juan Viñas, Costa Rica, ♂ 82, rh.

Figs. 12–22. Abnormalities in the inferior sector of the triangle or anal bridge. Figs. 12–16, 20–22, *P. mutans*, La Fria and Tachira, Venezuela; 17–18, *P. paulirica*, Guapiles, Costa Rica; 19, *P. distadens*, Turrúcares, Costa Rica. (Normal condition of this vein is shown in figs. 3, 5, 6, 10, 11, etc.)

Figs. 12–15. Four different positions of the distal end: ♂ 479, lf (La Fria); ♂ 416, lf, ♂ 465, rh, ♂ 431, lf (Tachira).

Figs. 16–18. Distal end branched: ♂ 487, lf (La Fria), ♀ *bb*, rh, ♂ *h*, lh.

Figs. 19–21. Bridge broken or incomplete: ♀ *ff*, rf, ♂ 420, lf (La Fria); ♂ 450, lf (Tachira).

Fig. 22. Bridge absent: ♂ 423, lf (Tachira).

Figs. 23–25. Pterostigma without a brace vein: *P. paulirica*, Guapiles, Costa Rica, ♂ *k*, rh (fig. 23), ♂ *f*, rf (fig. 24), *P. reventazoni*, Reventazón Valley, Juan Viñas, Costa Rica, ♂ 82, lh (fig. 25). (Normal condition is shown in text figure 1, page 10.)

Fig. 26. Vein descending from the nodus deflected proximad between the median vein and subnodal sector, *P. nathalia*, Guapiles, Costa Rica, ♂ *o*, lf. Compare text figure 1, page 10.

Fig. 27. Upper sector of arculus arising both as a "floating" vein and from the anterior side of the quadrilateral, *P. mutans*, Tachira, Venezuela, ♂ 429, rf.

Figs. 28–35. Additional supplemental basal postcostal cross-veins. The additional placed as follows:

Fig. 28. So placed that the usual supplemental of the opposite wing is at a level midway between the two supplementals, *P. nathalia*, Guapiles, Costa Rica, ♀ *qq*, lh.

Fig. 29. Distad to the usual supplemental but proximad to the level of the first antenodal, *P. distadens*, Turrúcares, Costa Rica, ♂ *p*, lh.

Fig. 30. Distad to the usual supplemental and also distad to the level of the first antenodal but proximad to, and distinct from, the principal basal postcostal cross-vein, *P. paulirica*, Guapiles, Costa Rica, ♂ *i*, rh.

Fig. 31. As stated for fig. 30, *P. distadens*, Turrúcares, Costa Rica, ♀ *ee*, rf.

Fig. 32. Proximad to and united with the principal b. pc. cross-vein (or the latter forked?), *P. paulirica*, Guapiles, Costa Rica, ♀ *bb*, lh.

Figs. 33–35. Distad to the principal b. pc. cross-vein, all from *P. paulirica*, Guapiles, Costa Rica; fig. 33, distinct from the anal bridge, ♂ *r*, lh; fig. 34, united with an unbranched anal bridge, ♂ *g*, rh; fig. 35, united with a branched anal bridge, ♂ *l*, rh.

Plates II–XVII. Palaemnema

On Plates II–XVII, A after a number always indicates a dorsal view of the apex of the male abdomen; B, a left profile view of the same; C, a supero-internal (dorso-mesal) view of the left *superior* appendage; D, a right profile view of the apex of the *penis;* E, a ventral view of the same or of one half thereof; F, a posterior (caudal) view of the apex of the right *inferior* appendage; G, a postero-supero-internal (caudo-dorso-mesal) view of the apex of the right *inferior* appendage; H, a dorsal view of the same; J, a ventral view of the same; K, a supero-external (dorso-lateral) view of the same; L, a right profile view of the *genitalia* of the second abdominal segment; M, a ventral view of the same; N, antero-superior view of apex of the right inferior appendage.

The lenses of the Zeiss compound microscope employed for most of these drawings have been: for A–C oc. 2, obj. A, lower lens off; for D–K and N oc. 4, obj. A, lower lens on; for L and M oc. 3, obj. A, lower lens off.

Plate II

Fig. 36. Labium and right maxilla, ventral view, *P. nathalia* ♂, Guapiles, Costa Rica. Balsam mount.

Fig. 37. Rear of head, left side, dorsal view, *P. mutans*, La Fria, Venezuela, ♀ 458, to show parorbital carina *pr; ml*, mid-dorsal line of head; *po*, post-occipital carina; *em*, margin of left compound eye.

Fig. 38. Postoccipital carina, dorsal view, *P. mutans*, ♀ 458.

Fig. 39. Prothorax and anterior end of mesothorax, postero-dorsal view, *P. mutans*, ♀ 458; dotted lines show outlines of pale spots, p_1 fore pronotal lobe without angular projection.

Figs. 40, 41. Similar views of *P. clementia*, La Fria, Venezuela, ♀ 580. Fig. 41, however, is slightly tilted so as to show a little more of the right propleuron than of the left. Dotted lines show outlines of dark markings; p_1, angular projection of fore pronotal lobe.

Figs. 42A–C, F–K. *P. paulirica* n. sp., ♂ *type*, Guapiles, Costa Rica, June 5, 1909.

Plate III

Figs. 42E–E‴, L, M. *P. paulirica* n. sp., Guapiles, Costa Rica, June 5, 1909, E, L and M from ♂ type; E′–E‴, from paratype ♂ *d*, show respectively a ventral, an oblique ventral and a more oblique ventral view of left penis filament. In figs. 42L and M:

f terminal filament of penis, showing its bilobed tip
ha anterior hamule
hp posterior hamule
it internal fold of glans penis (Kennedy, Ent. News, xxvii, p. 327, 1916)
la anterior lamina
lbat lamina batilliformis (sheath of the penis)
sk vesicle of the penis
sti spiracle of 2nd abdominal segment
tf terminal fold of glans penis (Kennedy, 1916, *l.c.*).

With the exception of *it* and *tf*, these letters are those used by Schmidt (Zool. Jahrb. Abt. Anat. Ontog., xxxix, taf. 9, fig. 1 and p. 196. 1915).

Fig. 43. Dorsal view, clypeus and labrum, *P. paulirica*, ♂ *d*.

Figs. 44, 45. Normal (right) and abnormal (left) antennae of *P. mutans*, Tachira, Venezuela, ♂ 428.

Figs. 46E, L, M. *P. distadens* n. sp., ♂ *type*, Quebrada Honda, Costa Rica, August 1, 1909.

Plate IV

Figs. 46A–C, F–K. *P. distadens* n. sp., ♂ *type*, as above; in 46A′ the apex is tilted a little more dorsad than in 46A.

Figs. 47A–K. *P. paulina* Drury, ♂, Honduras, trail back of Jilamo, etc., May 28, 1923.

PLATE V

Figs. 48A–G. *P. paulicoba* n. sp., ♂ *type*, Las Tortolas, Mexico, June 19, 1926; 48D shows both terminal filaments, 48E′ is an inner ventral view of left filament.

Figs. 49A–G″. *P. paulitoyaca* n. sp. 49A (enlarged from fig. 40, pl. V, Biol. Centr.-Amer., Neur.) and 49G′ (by Mr. Percy Highley) from ♂ type, Atoyac, Vera Cruz, Mexico, in British Museum (Natural History). 49G″ (by Mr. Percy Highley) from *P. angelina* ♂, Atoyac, of Biol. Centr.-Amer., Neur., p. 136, also in British Museum. Remaining figures from teneral male, Atoyac, in Coll. Acad. Nat. Sciences, Philadelphia.

PLATE VI

Figs. 50A–K′. *P. desiderata* Selys. 50A, 50B, enlarged from Hagen's drawings in the Museum of Comparative Zoology, labeled "1. Palaemna Paulina" in Hagen's hand, and made, possibly, from Ghiesbreght's male. 50A′, 50B′ drawn by M. Biesemen, from Ghiesbreght's male. 50C, 50G′ (*left* inferior appendage instead of right), 50K′ (postero-supero-internal view), from the same male. 50F, 50G, Presidio, Vera Cruz, Mexico, collected by O. W. Barrett.

PLATE VII

Figs. 50L, M. *P. desiderata* Selys, Ghiesbreght's male; *sk*, vesicle of the penis.

Figs. 51A–G′. *P. paulicaxa* n. sp., ♂ *type*, near Necaxa, Mexico. 51G′ is a supero-internal, *not* a postero-supero-internal, view; the dotted parallel lines show apparent ridges between striae.

PLATE VIII

Figs. 52A–J. *P. angelina* Selys. 52A, 52B, enlarged from Hagen's drawings in the Museum of Comparative Zoology, labeled "2. Palaemnema angelina d. Selys" in Hagen's hand, made, possibly, from Selys' type from Guatemala. All the other figures from ♂ *b*, El Fiscal, Guatemala, June 4, 1909, in coll. E. B. Williamson.

Figs. 53D–E. *P. paulitaba* n. sp., ♂ *type*, Tabasco, Mexico, in coll. F. Ris; 53D′, oblique view of penis tip from right side.

Fig. 54A. *P. domina* Calvert, ♂ *type*, Isthmus of Tehuantepec, Mexico, enlarged from fig. 42, pl. V, Biol. Centr.-Amer., Neur.

PLATE IX

Figs. 53A–J. *P. paulitaba* n. sp., ♂ *type*, as above.

Figs. 55A–G. *P. mutans* n. sp., ♂ *type*, La Fria, Venezuela, April 12, 1920, in coll. E. B. Williamson, except as follows: 55F″, ♂ paratype no. 418, La Fria, April 18; 55F‴, ♂ paratype, no. 406, Tachira, April 4; 55F⁗, ♂ paratype, no. 402, La Fria, April 4; all three show the apex of the right inferior appendage in posterior view. 55F′, from the ♂ type, shows the same view of the left inferior appendage.

Plate X

Figs. 56A–G′. *P. peruviana* Ris, ♂ *type*, Pozuzo, Peru, in coll. F. Ris. 56A, 56B, from fig. 52, Ris, 1918, cited page 66. 56C′, 56G′ from the *right* superior and *left* inferior appendages respectively.

Figs. 57A–G. *P. melanostigma* Hagen, ♂ 601, San Esteban, Venezuela, Feb. 8, 1920, except 57D′ which is from ♂ 603, same locality, Feb. 2, 1920, and shows only the apex of the right terminal penis-filament.

Figs. 58D–E′, L, M. *P. gigantula* n. sp., ♂ *type*, Peralta, Costa Rica, Aug. 8, 1909, except 58D which is from ♂ paratype, no. 87, same locality, Aug. 10, 1909.

Plate XI

Figs. 58A–C, F, G. *P. gigantula* n. sp., ♂ *type*, as above.

Figs. 59A–G. *P. brucei* n. sp., ♂ *type*, Cristalina, Colombia, Feb. 16, 1917, in coll. E. B. Williamson; except 59D′, ♂ paratype, no. 284, same locality, Feb. 12, 1917, which shows only the apex of right terminal penis-filament.

Plate XII

Figs. 60A–G. *P. azupizui* n. sp., ♂ *type*, San Nicolas to Miriatiriani, Peru, in coll. Cornell University. 60F′, apex of *left* inferior appendage, posterior view.

Figs. 61A–C, F, G′. *P. apicalis* Navás, ♂ *type*, Medina, Colombia, in coll. R. P. L. Navás. 61G′ is a supero-internal (*not* postero-supero-internal) view.

Plate XIII

Figs. 61D–E. *P. apicalis* Navás, ♂ *type*, as above. 60D′ is enlarged from 61D (oc. 2, obj. C).

Figs. 62A–G. *P. carmelita* Ris, ♂ *paratype*, Carmen, Colombia, June 17, 1908, ex coll. Ris.

Figs. 63A–C. *P. reventazoni* n. sp., ♂ *type*, Reventazón Valley near Juan Viñas, Costa Rica, July 28, 1909.

Figs. 63F–G′. *P. reventazoni* n. sp., ♂ *paratype*, same locality, June 28, 1909. 63G′, apex of *left* inferior appendage, postero-supero-internal view.

Plate XIV

Figs. 63D–E′, L, M. *P. reventazoni* n. sp., ♂ *type*, as above, except 63D, apex of right terminal penis-filament of *paratype* of June 28, 1909 (oc. 4, obj. C). 63E′ is an interno-ventral view of left penis-filament of type.

Figs. 64A, B. *P. nathalia* Selys, ♂ *paratype*, Panama, in Brussels Museum, drawn by M. Biesemen.

Figs. 64E, L, M. *P. nathalia* Selys, ♂ *b*, Guapiles, Costa Rica, June 5, 1909.

PLATE XV

Figs. 64A′–C′. *P. nathalia* Selys, ♂ *b*, as above.

Figs. 64B″, F, G. *P. nathalia* Selys, ♂ *w*, Turrúcares, Costa Rica, Aug. 15, 1909.

Figs. 65A–N. *P. clementia* Selys, ♂ 501, La Fria, Venezuela, April 16, 1920, in coll. E. B. Williamson, except 65D′, ♂ 504, same locality and collection, April 15, 1920.

PLATE XVI

Figs. 66A–E, G, K′. *P. croceicauda* n. sp., ♂ *type*, Cristalina, Colombia, Feb. 15, 1917, in coll. E. B. Williamson. 66K′, postero-supero-external view of *left* inferior appendage.

Figs. 67A–E, G, K′. *P. edmondi* n. sp., ♂ *type*, Cristalina, Colombia, Feb. 16, 1917, in coll. E. B. Williamson. 67K′, postero-supero-external view of *left* inferior appendage.

Figs. 68E, E′, L, M. *P. chiriquita* n. sp., ♂ *type*, Peralta, Costa Rica, August 10, 1909. 68E′, an interno-ventral view of left penis-filament.

PLATE XVII

Fig. 66F. *P. croceicauda* n. sp., ♂ *type*, as above.

Fig. 67F. *P. edmondi* n. sp., ♂ *type*, as above.

Figs. 68A–C, H. *P. chiriquita* n. sp., ♂ *type*, as above.

Figs. 68F, G′. *P. chiriquita* n. sp., ♂ *paratype*, same locality and date; 68G′, postero-superior (not postero-supero-internal) view.

Figs. 69A–G. *P. melanota* Ris, ♂ *type*, Tuis, Turrialba, Costa Rica, in coll. F. Ris.

PLATES XVIII–XXI

Thoracic Color Patterns, Right Side or Ventral

PLATE XVIII

Fig. 70. *P. paulirica* n. sp., ♂ *type*, Guapiles, Costa Rica.

Fig. 71. *P. paulirica* n. sp., ♂ *d*, *paratype*, same locality.

Fig. 72. *P. distadens* n. sp., ♂ *type*, Quebrada Honda, Costa Rica.

Fig. 73. *P. paulina* Drury, ♂, trail back of El Jilamo, Honduras.

Figs. 74–76. *P. paulitoyaca* n. sp., all drawn by Mr. Percy Highley from specimens in the British Museum of Natural History. 74, 76, ♂ *type*, Atoyac, Vera Cruz, Mexico (*paulina* of B. C.-A., Neur., p. 136); 75, ♂, same locality (*angelina* of B. C.-A., Neur., p. 136).

Fig. 77. *P. paulicaxa* n. sp., ♂ *type*, near Necaxa, Puebla, Mexico.

Plate XIX

Figs. 78–81. *P. desiderata* Selys. 78, 80, Ghiesbreght's male, Mexico, (*paulina* Selys), Brussels Museum, drawings by M. G. Severin, who writes that the area enclosed by the dotted line on fig. 78 is "cassé et couvert de gomme"; the extent of the injured part is not indicated in fig. 80. 79, 81, Presidio, Vera Cruz, Mexico.

Figs. 82, 84. *P. paulitaba* n. sp., ♂ *type*, Tabasco, Mexico.

Fig. 83. *P. angelina* Selys, ♂ *b*, El Fiscal, Guatemala, June 4, 1909.

Fig. 85. *P. domina* Calvert, ♂ *type*, Isthmus of Tehuantepec, Mexico.

Plate XX

Fig. 86. *P. mutans* n. sp., ♂ *type*, La Fria, Venezuela, April 12, 1920.

Fig. 87. *P. melanostigma* Hagen, ♂, San Esteban, Venezuela, Feb. 8, 1920.

Fig. 88. *P. gigantula* n. sp., ♂ *type*, Peralta, Costa Rica, Aug. 8, 1909.

Fig. 89. *P. brucei* n. sp., ♂ *type*, Cristalina, Colombia, Feb. 16, 1917.

Fig. 90. *P. azupizui* n. sp., ♂ *type*, S. Nicolas to Miriatiriani, Peru.

Fig. 91. *P. apicalis* Navás, ♂ *type*, Medina, Colombia.

Fig. 92. *P. carmelita* Ris, ♂, Carmen, Colombia. The dotted line shows the greater extension dorsad of the dark stripe on the metapleural suture in the Villa Elvira ♂.

Fig. 93. *P. reventazoni* n. sp., ♂ *type*, Reventazón Valley, near Juan Viñas, Costa Rica.

Plate XXI

Fig. 94. *P. nathalia* Selys, ♂ *type* or *paratype*, Panama. Drawing by M. Severin.

Fig. 95. *P. nathalia* Selys, ♂ *b*, Guapiles, Costa Rica.

Figs. 96–98. *P. clementia* Selys, ♂♂ 501, 508, 528, La Fria, Venezuela, April 16, April 16 and April 15, 1920, respectively.

Fig. 99. *P. croceicauda* n. sp., ♂ *type*, Cristalina, Colombia.

Fig. 100. *P. edmondi* n. sp., ♂ *type*, Cristalina, Colombia.

Fig. 101. *P. chiriquita* n. sp., ♂ *type*, Peralta, Costa Rica.

Fig. 102. *P. melanota* Ris, ♂ *type*, Tuis, Turrialba, Costa Rica.

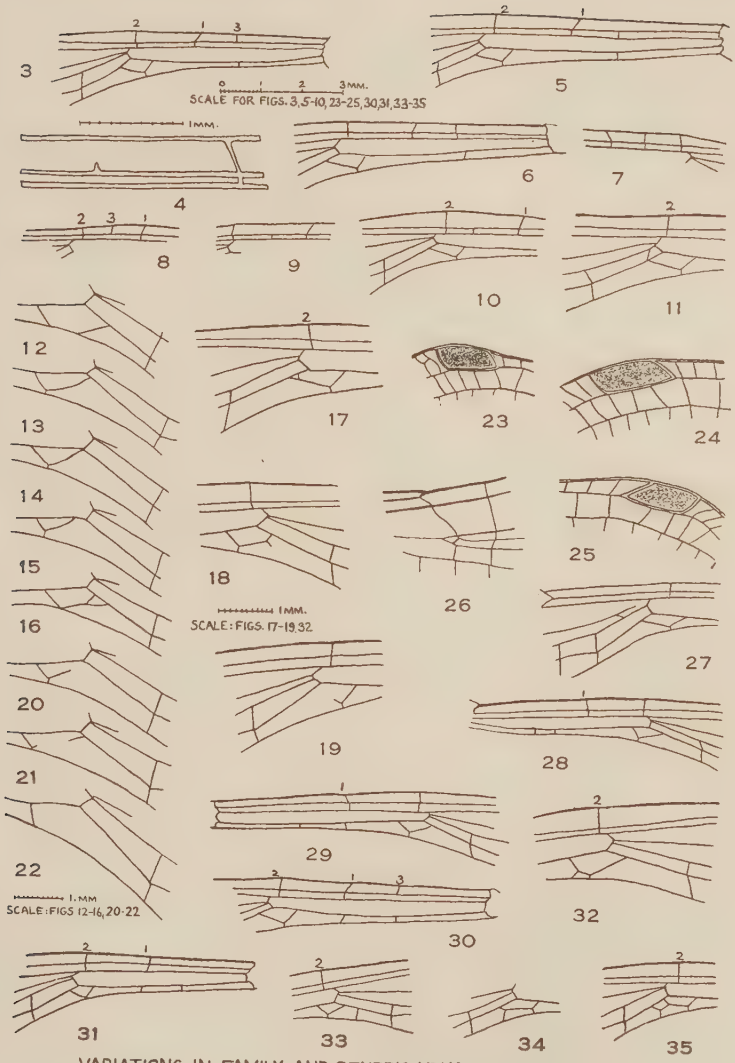
Index to Species of Palaemnema

The principal reference to each species is in heavy-face type; * marks species here described as new.

angelina, 2, 4, 5, 6, 8, 9, 15, 18, 19, 23, 26, 29, 35, 42, 47, 48, 49, 50, **58**
apicalis, 4, 9, 19, 23, 28, **81**
azupizui*, 9, 19, 23, **78**
brucei*, 8, 9, 13, 19, 23, 27, 29, **75**, 96, 98, 100
carmelita, 3, 9, 19, 23, 28, 29, 82, **83**
chiriquita*, 9, 19, 23, 30, **100**, 103
clementia, 3, 5, 6, 9, 13, 19, 23, 30, 31, 65, **93**, 98
croceicauda*, 9, 19, 23, 30, 31, 95, **96**, 100
desiderata, 3, 5, 6, 9, 18, 23, 25, 42, 43, 46, **50**, 55
distadens*, 9, 19, 21, 23, 24, 25, 27, 28, 34, **35**, 50, 86, 92
domina, 3, 9, 18, 23, 24, 28, **61**
edmondi*, 9, 19, 23, 30, 98, **99**
gigantula*, 9, 19, 23, 27, 29, **72**, 101
melanostigma, 2, 5, 6, 9, 19, 23, **27**, 29, **68**, 93, 96
melanota, 3, 9, 19, 23, 31, 32, 101, **102**
mutans*, 8, 9, 13, 19, 23, 26, 27, 29, **63**, 96
nathalia, 3, 5, 6, 8, 9, 15, 18, 19, 21, 23, 30, 31, 33, 35, 37, 38, 52, **86**, 103, 104
paulicaxa*, 9, 18, 19, 23, 24, 26, **54**, 57
paulicoba*, 9, 18, 23, 25, **45**, 55
paulina, 2, 3, 4, 6, 19, 23, 25, 32, **39**, 47, 49, 50, 53, 54, 58
paulirica*, 8, 9, 15, 19, 23, 25, 28, **32**, 37, 38, 44, 47, 50, 55, 92, 103
paulitaba*, 8, 9, 18, 23, 26, 29, 47, 55, **56**
paulitoyaca*, 9, 18, 23, 25, 42, 43, 46, **47**, 52
peruviana, 3, 19, 23, 27, **66**, 80
reventazoni*, 8, 9, 15, 19, 21, 23, 28, 38, **85**

The sad news of the sudden and unexpected death of Dr. Fritz Ris on January 30, 1931, arrived just as the second proof-reading of this paper was completed. Dr. Ris had been a corresponding member of the American Entomological Society since April 26, 1923. The foregoing pages testify to the fact that, without his kindly help, they would be much more imperfect than they are. Students of the Odonata throughout the world will mourn the passing of the master. Those who, like the writer, enjoyed his personal acquaintance and a correspondence extending through many years, will feel the deeper sense of irreparable loss.

P. P. Calvert.



VARIATIONS IN FAMILY AND GENERIC VENATIONAL CHARACTERS.

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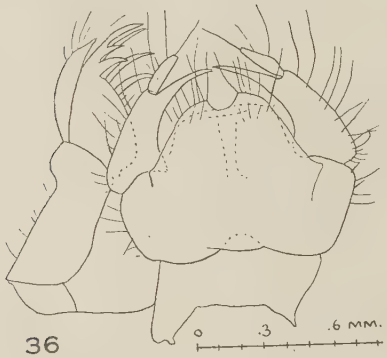

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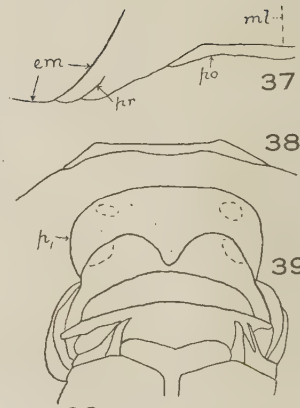
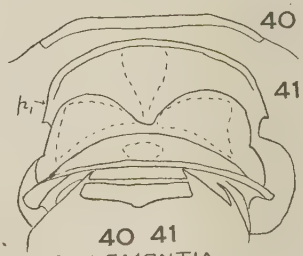


37-39 P. MUTANS

42 A

42 C

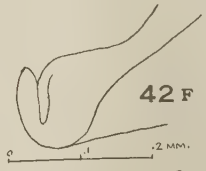


40 41
P. CLEMENTIA

42 B

42 P. PAULIRICA

42 H



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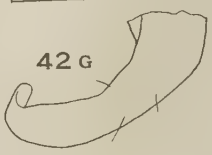

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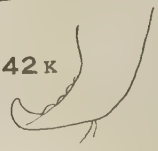

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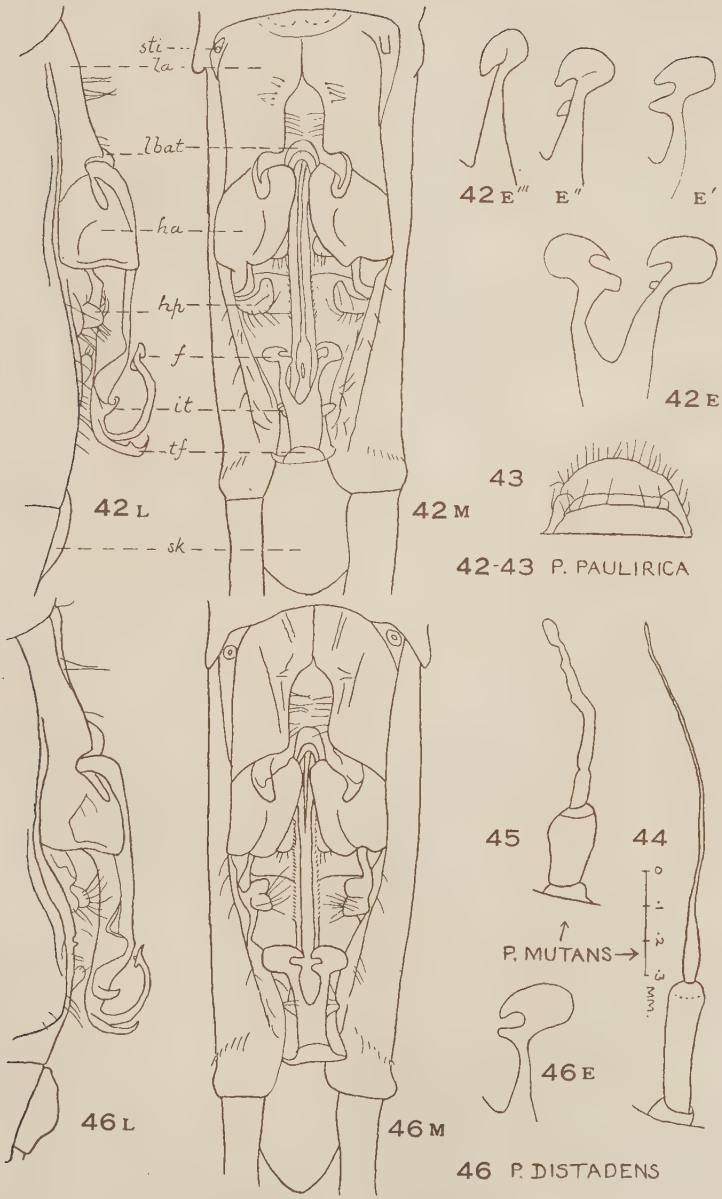

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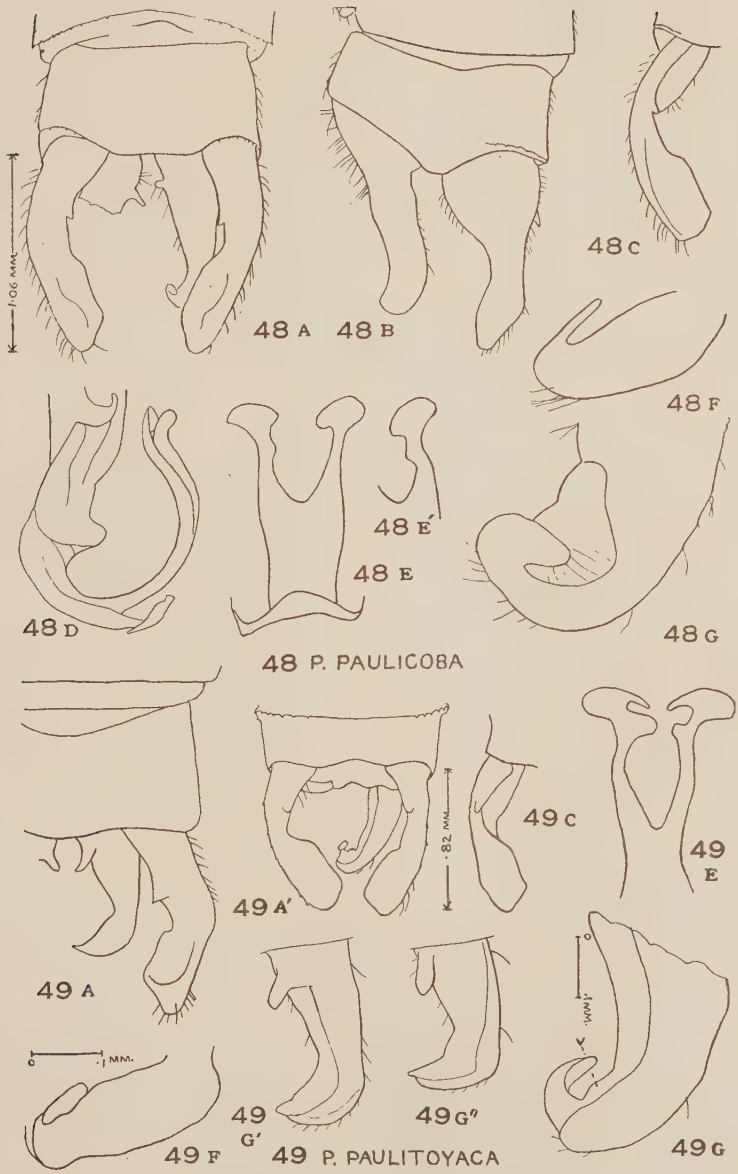

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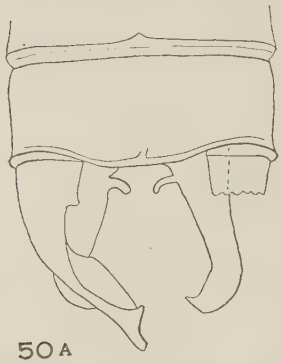

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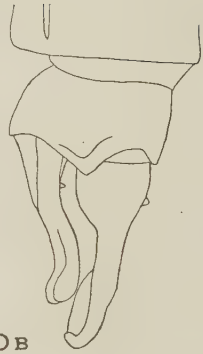

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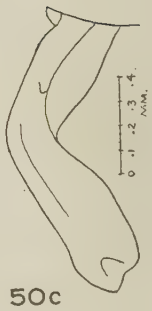

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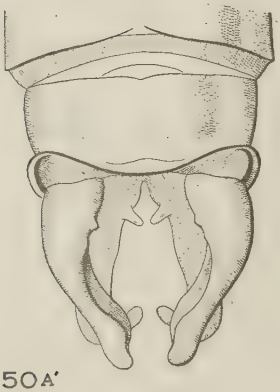
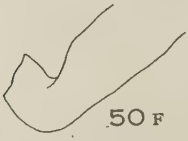


50 A'

50 B'

50 G'



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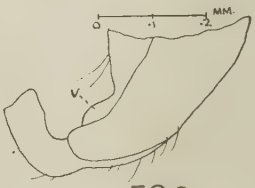

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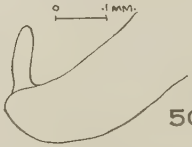

50 K'

50 P. DESIDERATA

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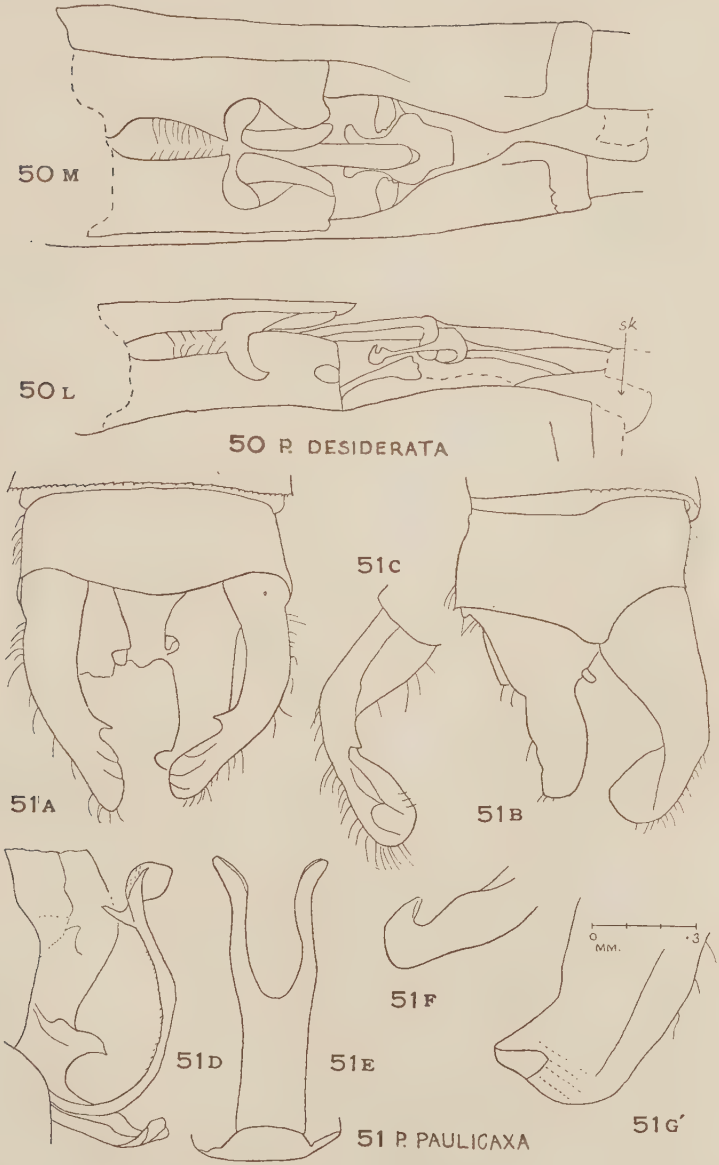

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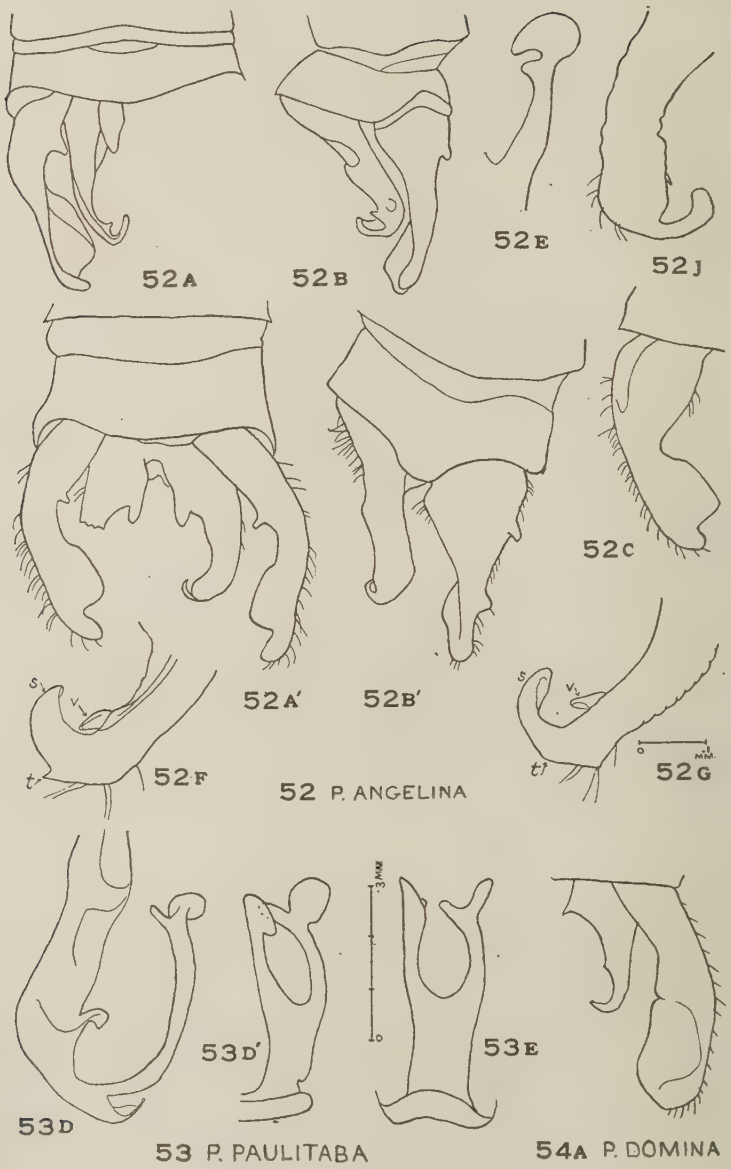

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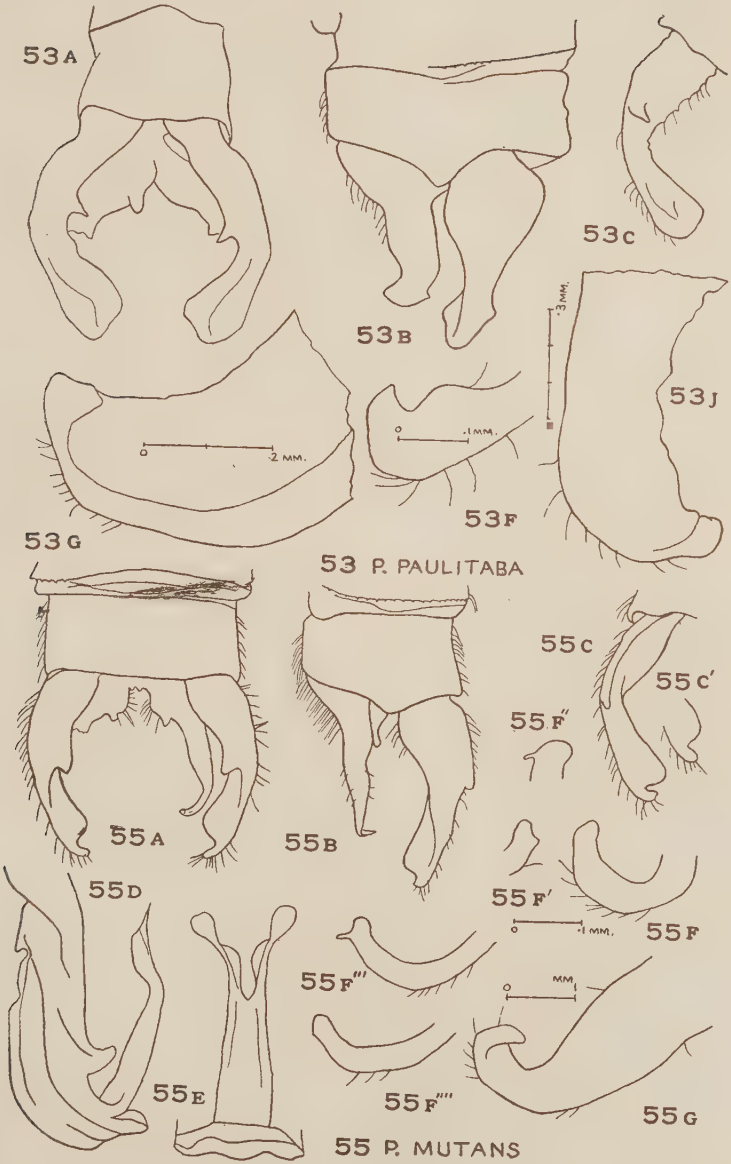

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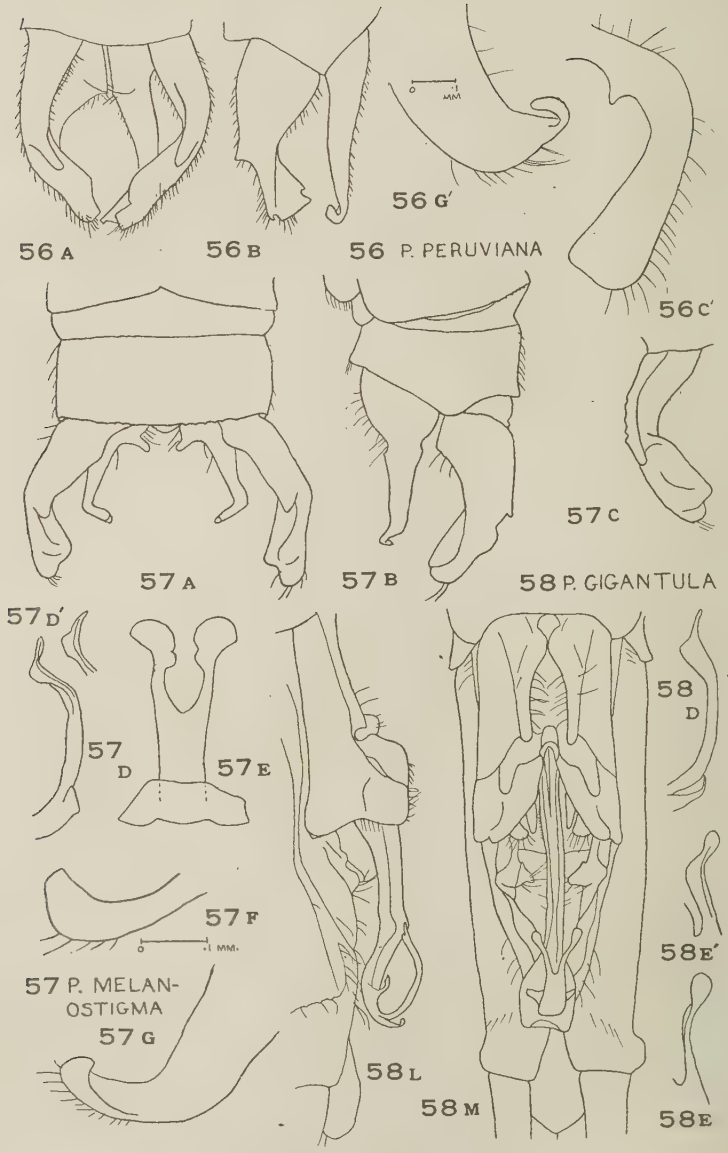

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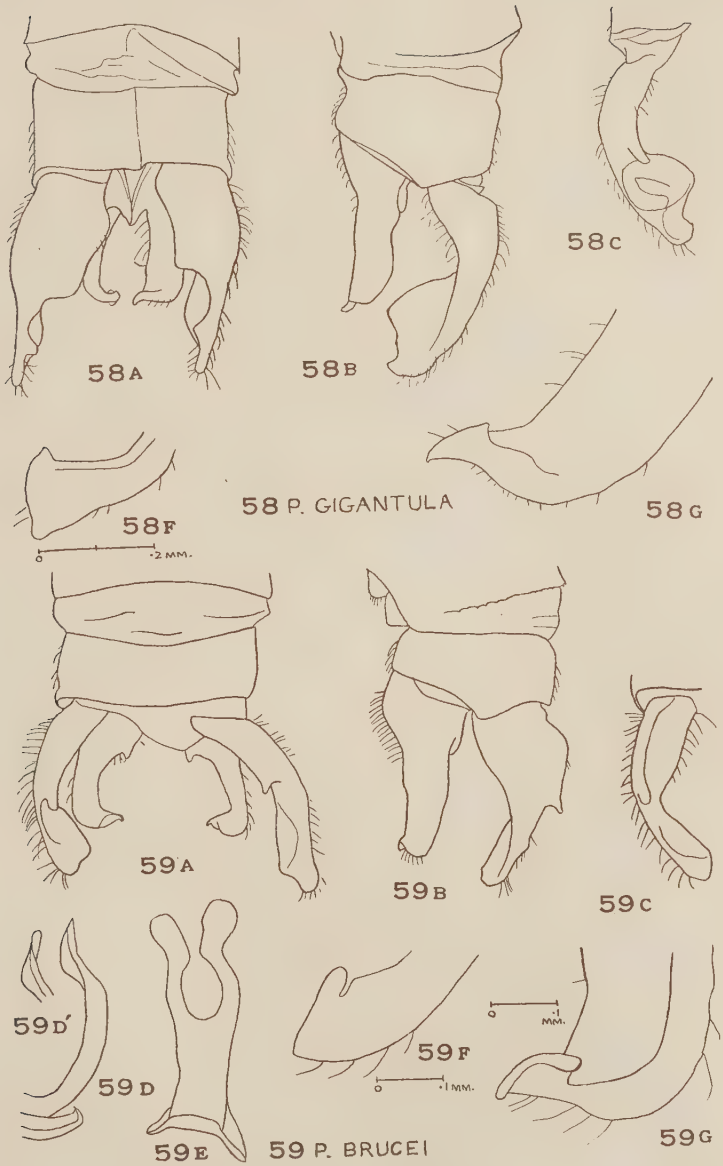

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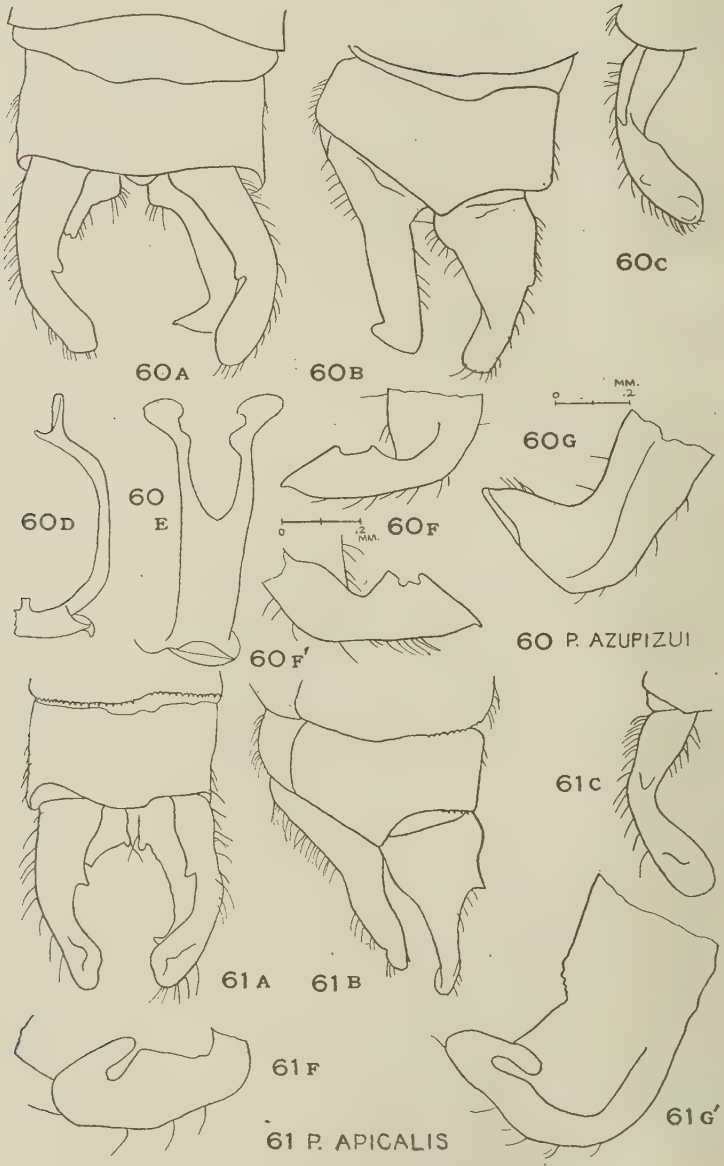

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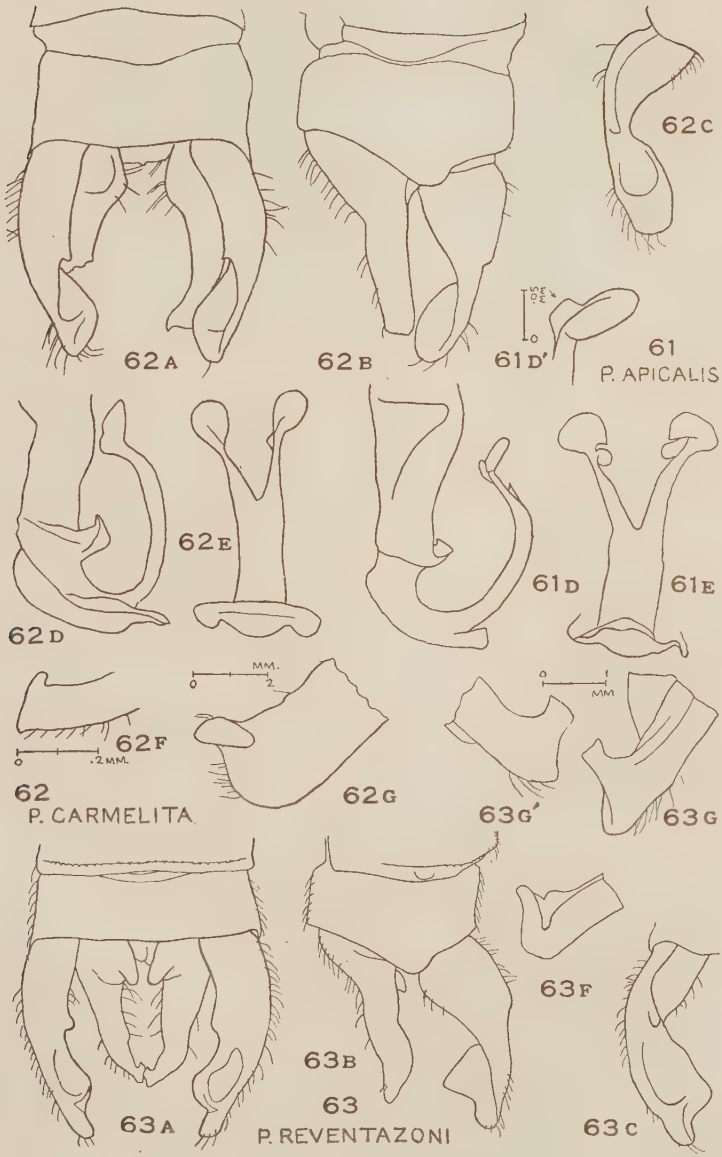

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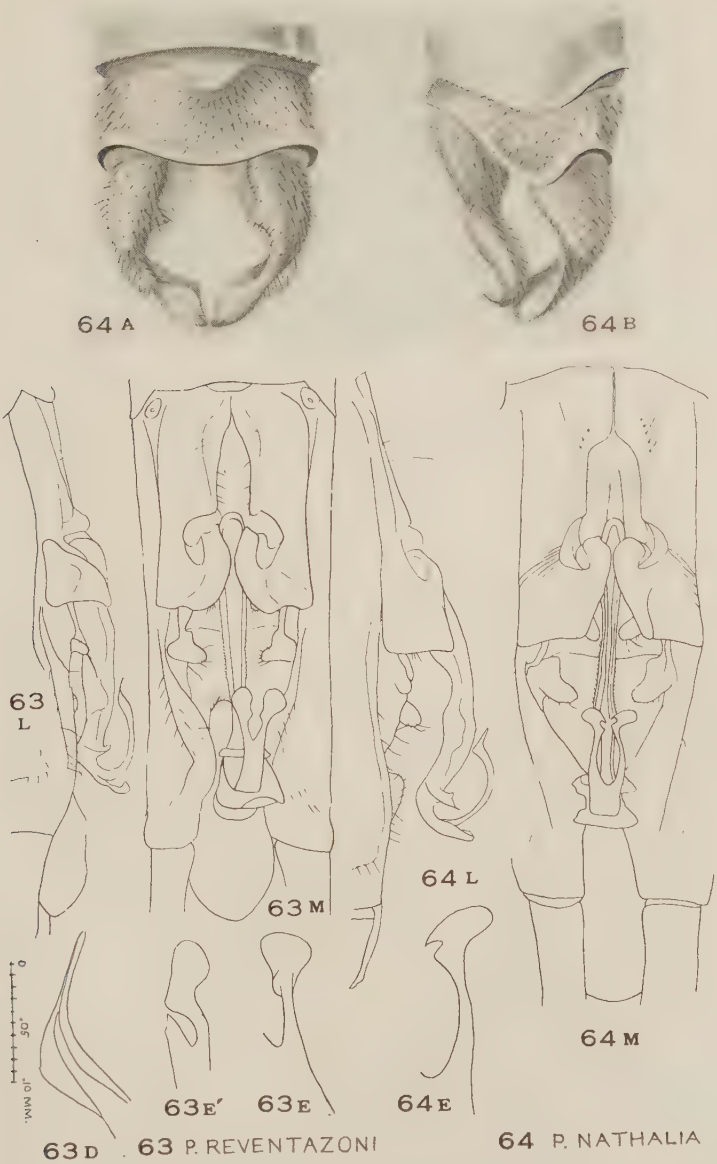

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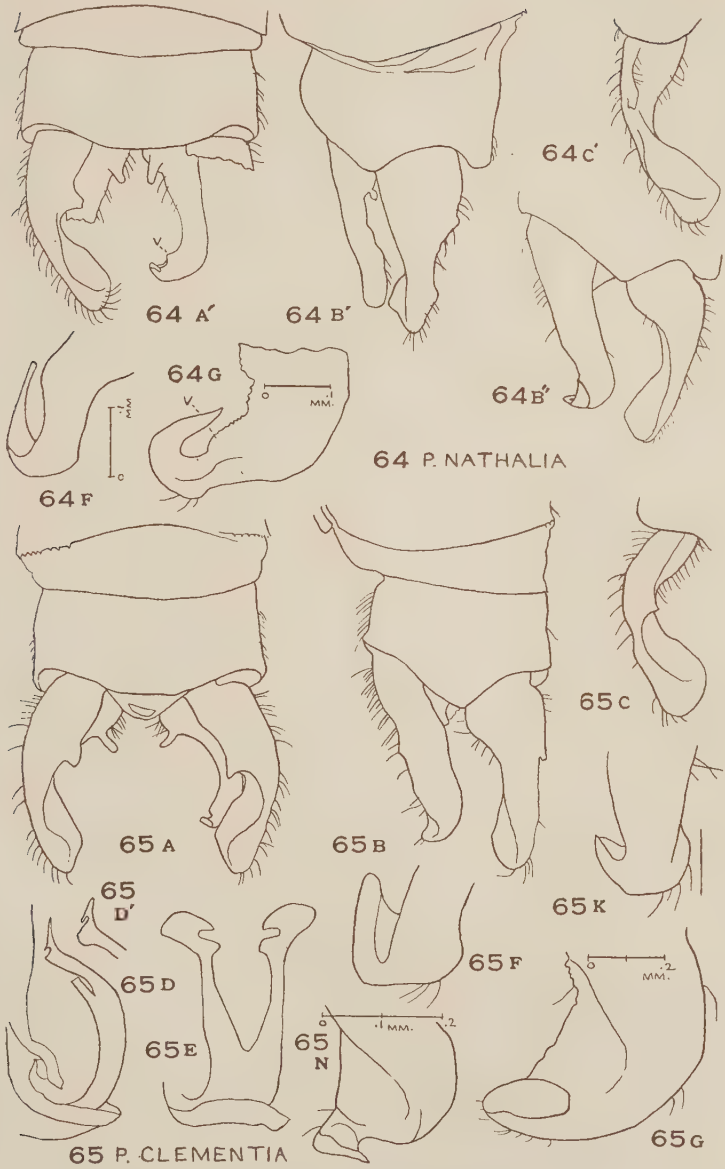

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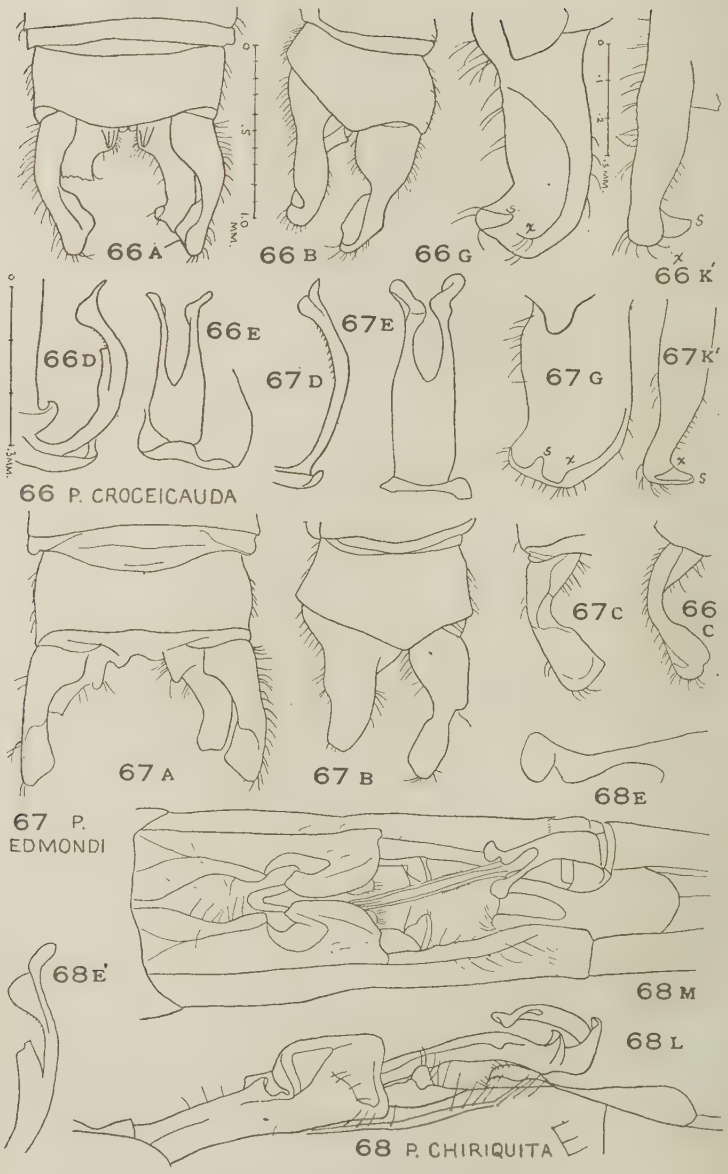

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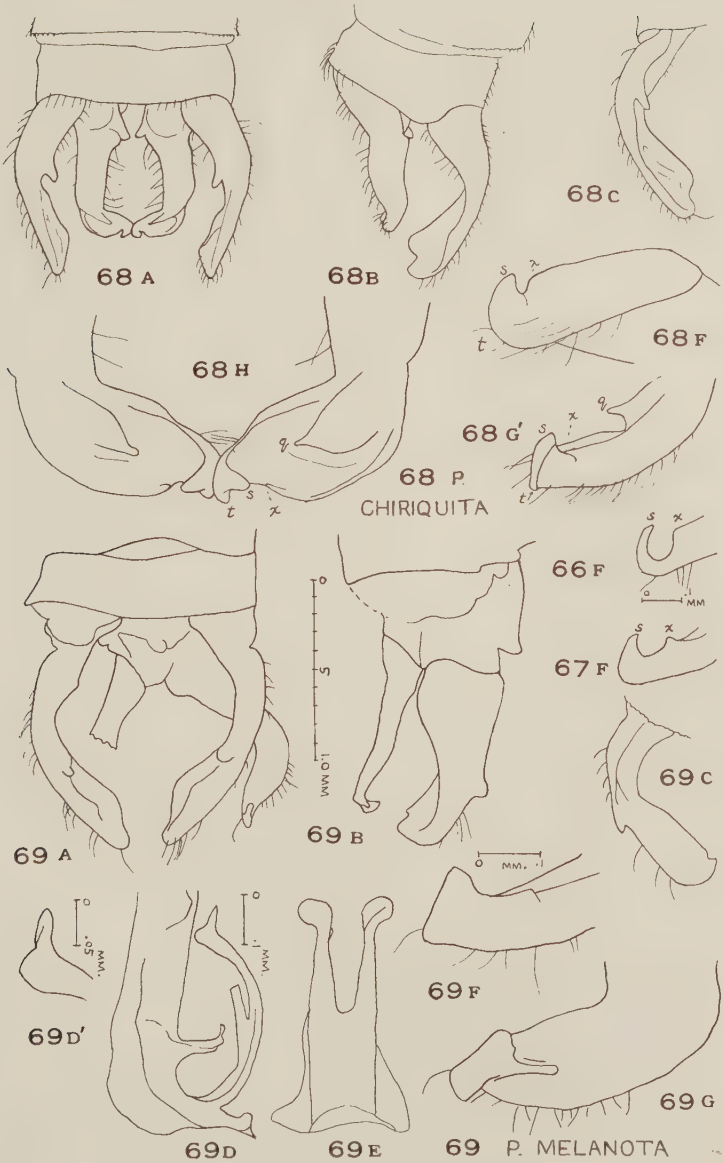

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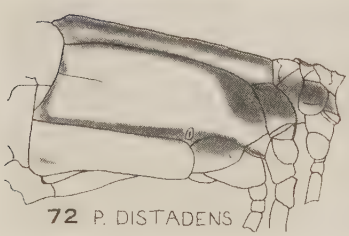
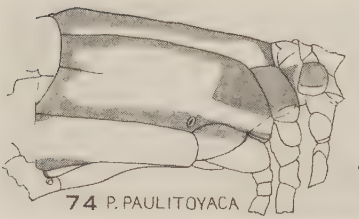
70 P. PAULIRICA

71 P. PAULIRICA



72 P. DISTADENS

73 P. PAULINA



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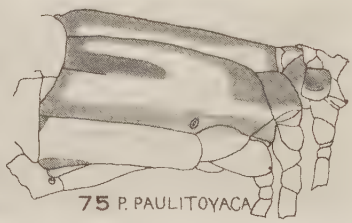

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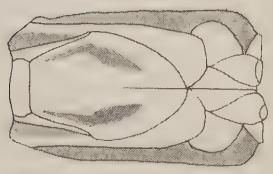

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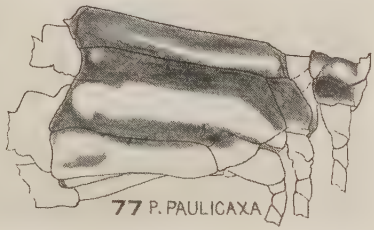

77 P. PAULICAXA

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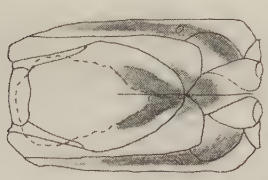

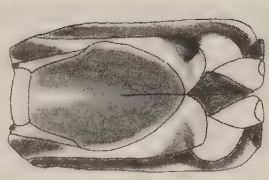

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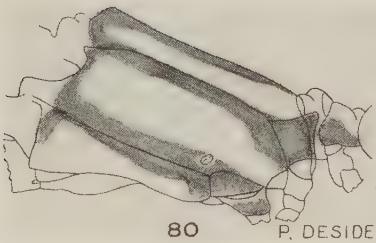

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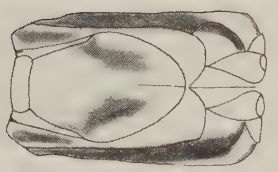

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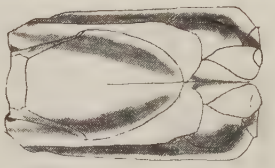

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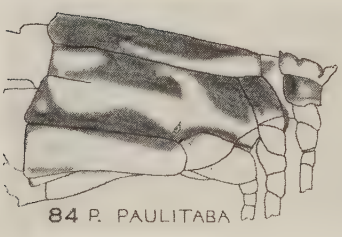

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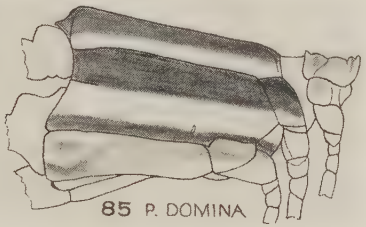
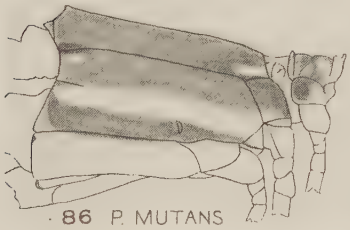


85 P. DOMINA

CALVERT—PALAEMNEMA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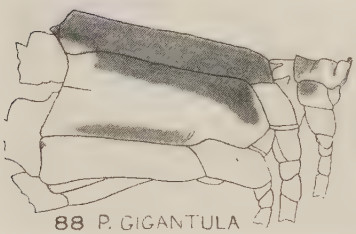
87 P. MELANOSTIGMA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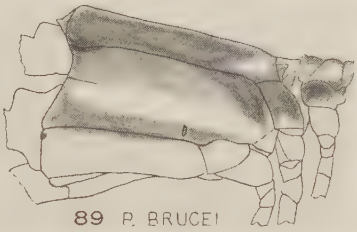
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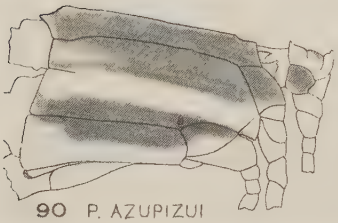
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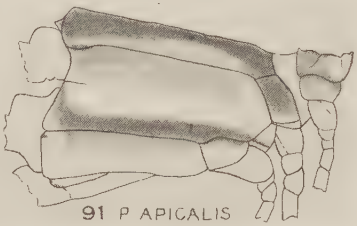
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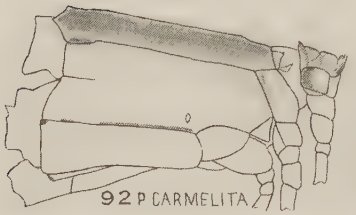
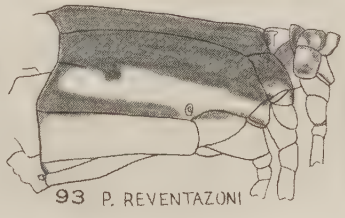

92 P CARMELITA


93 P. REVENTAZONI

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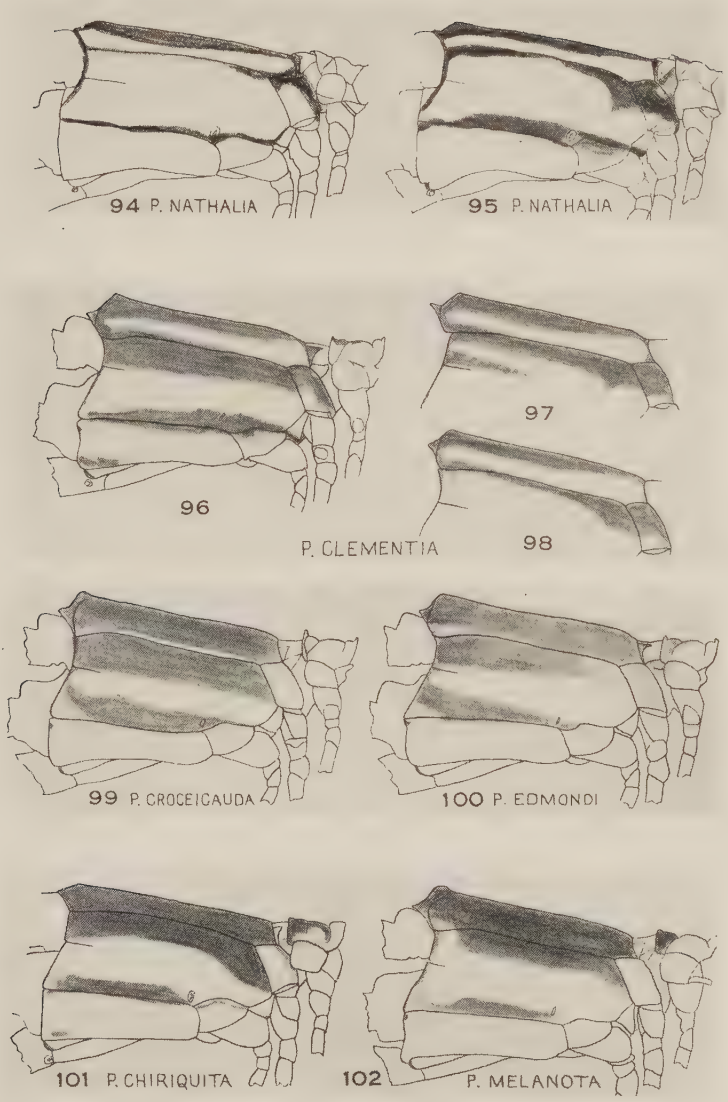

CALVERT—PALAEMNEMA

STUDIES IN LOWER CALIFORNIAN ORTHOPTERA

BY MORGAN HEBARD

(Plate XXII)

During the early months of 1930 (February 10th to April 3d), Mr. Clement Buckley Newbold and Mr. Binghan Willing Morris collected Orthoptera in Lower California while on a field expedition in that region.

At that season many species, which later would be present, have not yet made their appearance and consequently the decided scientific value of the collection which was secured is surprising. This aggregates ninety-two specimens, representing fourteen genera and ten species, of which one genus and three species prove to be new. In addition, the presence of an aberrant individual of another species has made necessary the description of a new geographic race of that species, based on a series secured near the Lower California line in southern California by Rehn and Hebard some years ago. Of the other species three had not previously been found in Lower California, while the first specimens not preserved in alcohol of *Litoscirtus insularis* and of the male sex of *Calamacris mexicanus*, add greatly to the exact knowledge of these little known insects.

Adding the information obtainable from other collections of Orthoptera which have been made in Lower California, it is evident that the northern portion is very similar to the extreme southern portion of California, several interesting forms being peculiar to the limited western portion of that region.

In the central portion of the peninsula the fauna is apparently very poor, but again there are a few species which are found neither to the North nor South. In that area lies, however, the

Sierra San Pedro Martyr, the highest mountains in Lower California. In the central portion of these mountains, at high elevations, should be found a number of species new to Lower California, some of which may be new to science as well.

The extreme southern portion, apparently beginning below La Paz and including the Sierra de la Victoria, is probably the richest area. From that region not only are known a greater number of species not occurring elsewhere, but some of the widespread species there found show features indicating the beginning of racial differentiation.

The literature on the Orthoptera of Lower California is scattered, the most important publications being Bruner's in the Biologia Centrali-Americana, 1893 to 1908, and the author's report on the Dermaptera and Orthoptera secured by the Expedition of the California Academy of Sciences to the Gulf of California, in 1921.[1]

Mantidae

AMELINAE

YERSINIOPS new genus

We erect this genus to include *Yersinia solitaria* Scudder, *Yersinia sophronica* Rehn and Hebard and the new species here described. There, therefore, remains in *Yersinia* Saussure the single species, *mexicana*, originally referred by that author to *Acanthops*. Though agreeing in many features, these genera are easily separated by the characters given below.

A. Size large (Length ♂ 31 to 36, ♀ 31.3 to 41 mm.), form comparatively robust for this group which includes small and slender species. Eyes acute dorso-laterad but not projecting at all dorsad, so that in direct cephalic aspect the dorsal contour of the head is transverse or broadly convex. Both sexes brachypterous. Sinaloa, Mexico, southward. *Yersinia* Saussure. Genotype—*Y. mexicana* (Saussure)

AA. Size small (Length ♂ 19.6 to 27, ♀ 21.8 to 28.7 mm.), form slender. Eyes acute-conical dorso-laterad, projecting well above the occiput. Organs of flight absent. Colorado southwestward to Lower California.
Yersiniops new genus. Genotype—*Y. solitaria* (Scudder)

[1] Proc. California Acad. Sci., (4), XII, pp. 319 to 340, (1923).

Yersiniops newboldi new species (Pl. XXII, fig. 1)

This species is particularly interesting in being the first of the genus to be found south of the United States[2] and the first to be discovered in Lower California, though several extensive expeditions which collected Orthoptera had in previous years been made in that region.

The general appearance of *newboldi* is closer to that of *solitaria* than to that of *sophronica*, the eyes no more produced but with their immediate apices distinctly more definitely mammate. From both of those species it is readily separated by a minute but very definite node on each side of the dorsal margin of the occiput just before its juncture with the eye. The serrations on the lateral margins of the pronotum are also decidedly heavier and this is particularly noticeable on the shaft in the female sex where they become decided teeth; there are also scattered nodes over the dorsal surface of the pronotum in *newboldi*, more prominent and numerous in females than in males.

Type.—♀; ten miles below Todos Santos, on Pacific, Lower California. March 29, 1930. (Newbold and Morris.) [Acad. Nat. Sci. Phila., Type No. 5495.]

The most important diagnostic characters for this species are given above; other noteworthy features are the following. Lateral ocelli closer to each other than to the median ocellus ventrad, the three joined by a U-shaped carina. Surface of abdomen showing weak longitudinal ridges and each tergite with a series of very short longitudinal carinae at the caudal margin, these particularly distinct proximad. Supra-anal plate almost semicircular, with a pronounced medio-longitudinal carina; shorter than in *solitaria* or *sophronica*. Limbs and their armament as in those species.

Allotype.—♂; San Lucas, Lower California. March 31, 1930. (Newbold and Morris.) [Acad. Nat. Sci. Phila.]

Similar to female but much smaller and more slender. Lateral ocelli even more closely approximate, with U-shaped carina joining them to median ocellus, consequently forming a decidedly narrower U. Supra-anal plate very broadly rounded-triangular produced, very distinctly shorter than broad and shorter than in *solitaria* or *sophronica*.

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[2] Though *solitaria* and *sophronica* will undoubtedly be found over the line, the former in northwestern Chihuahua, the latter in northern Sonora.

General coloration almost uniform, individually varying from mummy brown to sayal brown. The paler specimens sometimes are longitudinally streaked with darker and have the lateral margins of the mesonotum and metanotum paler. The type alone shows weak transverse suffusions of brown on the buffy cephalic femora, but all show a longitudinal blackish suffusion proximad on the outer half of the ventral surface.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of caudal femur
♂				
San Lucas. *Allotype*	20.4	5	1.7	10.2
San Antonio. *Paratype*	21.8	5.7	1.9	10.6
San Antonio. *Paratype*	20	4.9	1.7	9.8
♀				
Todos Santos. *Type*	27	6.2	2.4	11
Todos Santos. *Paratype*	28.7	6.4	2.5	11

The species apparently occurs only at the southern extremity of Lower California.

Specimens Examined: 10; 3 males, 2 females and 5 immature individuals.

Near San Antonio, eastern foot of Sierra de la Victoria, IV, 3, 1930, (in shady gully), 2 ♂ *paratypes*, 1 juv. ♂.

San Bartolo, IV, 3, 1930, 1 juv. ♀, 1 small juv. ♀.

Ten miles below Todos Santos, III, 29, 1930, (among creeping bushes in dunes on Pacific), 1 ♀ *type;* III, 30, 1930, (at camp fire at night), 1 ♀ *paratype.*

San Lucas, a few hundred feet above sea level, III, 31, 1930, 1 ♂ *paratype,* 1 juv. ♂, 1 juv. ♀.

Acrididae

ACRIDINAE

Horesidotes cinereus saltator new subspecies (Pl. XXII, fig. 2)

This insect agrees fully with typical *cinereus* except in the features given below. So consistent is the large series originally secured in these differences that we feel fully justified in giving it subspecific rank. It is probably local and confined to the narrow area between the mountains and the Pacific Ocean.

Very similarly recognizable geographic races are *Melanoplus occidentalis brevipennis* Bruner and *Melanoplus kennicotti nubicola* (Scudder), though in the present case more features of difference from the typical condition are shown.

Type.—♂; Tia Juana, California. September 11, 1922. (Rehn and Hebard.) [Hebard Cln., Type No. 1171.]

Size smaller and form as graceful as in typical *cinereus;* more slender than in *H. papagensis* Rehn and Hebard. Fastigium as in typical *cinereus*, distinctly narrower than in *papagensis*. Organs of flight very decidedly reduced, incapable of flight, only about three-fifths as long as the caudal femur. The latter proportionately shorter and heavier than in typical *cinereus*.

Allotype.—♀; same data as type. [Hebard Cln.]

Much larger than male, differing from the female of typical *cinereus* as does the male from that sex of that insect.

The many color phases of this species are shown by the series of *cinereus saltator*. Some individuals are pale straw color, individual variations grading to a dark brown phase with dorsum more grayish flecked with dark brown, the face and lateral lobes of the pronotum ventrad being usually buffy even in such dark individuals. Occasionally there is a narrow light brown dorsal medio-longitudinal band on head and pronotum and the latter occasionally has the lateral carinae very contrastingly but finely defined in buff. Unlike in *Eritettix*, these different color patterns of the dorsal surface of the pronotum have no effect whatever on the carinae. The caudal tibiae are grayish paling proximad, but in some very pale specimens the grayish tinge is very weak, these members being then weakly buffy.

The extremes measure as follows (the type being a maximum for the males): length of body ♂ 12.4 to 13.7, ♀ 17.7 to 18.8; length of pronotum ♂ 2.6 to 2.8, ♀ 3.7 to 3.8; length of tegmen ♂ 5.7 to 5.8, ♀ 7.3 to 7.6; length of caudal femur ♂ 9.3 to 9.4, ♀ 11.4 to 12.8 mm.

In addition to the described pair, fourteen males and twelve females, bearing the same data, are considered paratypes. This series was secured on the first hillsides overlooking the Pacific in the thick low chaparral where individuals were to be found on the ground or in the brush. "They leap with great power and agility and when alarmed usually make several jumps with little or no pause. They can, however, be taken by a quick and accurate sweep of the net more easily than such species as *Xeracris minimus* (Scudder), which species is similarly extremely

rapid when it leaps into flight, but crouches at the swing of the net, springing instantly the net has passed. A few specimens when closely pursued down to the ground at the base of the brush there remained motionless, with caudal limbs a-kimbo, in that position closely resembling the adjacent twigs and litter."

Near San Antonio at the eastern foot of the Sierra de la Victoria, in southern Lower California, on April 3, 1930, a female was secured in a shady gully, which is intermediate between this race and *cinereus cinereus* Scudder. The organs of flight in this specimen are slightly shorter than the caudal femora and the tegmina are considerably narrower than in typical *cinereus*. Closer agreement with *cinereus saltator* is, however, shown by the smaller size and shorter and proportionately more robust caudal femora.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
♀ San Antonio, Lower Cal.	17.2[3]	3.7	12	12.8	3.1
cinereus cinereus					
♀ Palm Springs, Cal. *Paratype*	22	4.9	19.6	14.8	3.2

Psoloessa sp.

This is the common species which has been recorded from the coastal portion of southern California and from Lower California as *Psoloessa texana* Scudder. Rehn, who is revising the genus, tells us that it represents a distinct species which he will shortly describe.

Ensenada, II, 10, 1930, (in brushy arid region), 4 ♀.

Hamilton's Ranch near Santo Domingo Mission, II, 15, 1930, (on open dry sandy spots of brush flat), 1 ♂, 3 ♀; II, 16, 1930, (on decomposed rock, sea level to 500 feet), 2 ♀; II, 17, 1930, (in thickets of sandy creek bottom), 1 ♀.

Cape San Lucas, III, 30 and 31, 1930, 2 ♀.

[3] Abdomen strongly retracted.

OEDIPODINAE

Chimarocephala pacifica incisa Caudell

Though described as a variety of *pacifica*, we now have sufficient Californian material to state definitely that *pacifica pacifica* (Thomas) is a northern and *pacifica incisa* a southern race. Though typical *pacifica* shows very decided reduction in the organs of flight in the female sex, no such reduction takes place in the present race.

Ensenada, II, 12, 1930, (in dead leaves under oaks), 1 ♀, 2 juv. ♂, 1 juv. ♀.

Hamilton's Ranch near Santo Domingo Mission, II, 16, 1930, (500 feet above sea level on arid hillside), 1 ♂.

Lactista gibbosus Saussure

Ensenada, II, 10, 1930, (on dry leaves under green bushes), 1 ♀.

Hamilton's Ranch near Santo Domingo Mission, II, 15, 1930, (in open on plains rising gently from the sea), 2 ♂, 2 ♀; II, 16 and 17, 1930, (in cactus and brush on arid hillside 500 feet above sea level), 1 ♀.

Near San Antonio, eastern foot of Sierra de la Victoria, IV. 3, 1930, (in shady gully), 2 ♂, 2 ♀, 2 juv. ♀.

Cape San Lucas, III, 31, 1930, 4 ♂, 1 ♀.

This species is known to be abundant in southern coastal California, Lower California and Sinaloa.

Conozoa sulcifrons sulcifrons (Scudder)

Hamilton's Ranch near Santo Domingo Mission, II, 17, 1930, (in sandy creek bottom), 1 ♂, 2 ♀.

This insect is very abundant in such environment in southern California, but had not previously been found in Lower California.

Trimerotropis pallidipennis pallidipennis (Burmeister)

Hamilton's Ranch near Santo Domingo Mission, II, 16, 1930, (on gravel among dry brush), 2 ♂.

Western foothills of Sierra San Pedro Martyr, 1000 feet, II, 25, 1930, 1 ♂, 1 ♀.

Onyx Mine, El Marmol, 2000 feet, III, 11, 1930, 2 ♀.

Fifty four miles southwest of El Marmol, 1000 feet, III, 10, 1930, (on mesa top), 3 ♂.

Chapalla Dry Lake, sixty miles south of El Marmol, III, 19, 1930, 1 ♂.

Ten miles below Todos Santos, III, 29, 1930, (in dunes on the Pacific), 2 ♂.

This is an ubiquitous species in the western United States and northern Mexico.

Heliastus parviceps (Walker)

1870. *Oedipoda parviceps* F. Walker, Cat. Dermapt. Saltat. British Mus., IV, p. 732. [♂; West Coast of North America.]

1889. *Thrincus* (?) *aridus* Bruner, Proc. U. S. Nat. Mus., XII, p. 78, pl. I, figs. 2 and 3. [♂, ♀; Albuquerque, New Mexico.]

In 1925 Uvarov referred *parviceps* to the "*californicus-aridus-minimus*" group of the genus *Heliastus*. We have now sent material representing the related species to him and his reply is as follows, after comparison with the type of *parviceps*. "It is the same size as a Cape San Lucas female and differs from it only in having the vertex less narrow and less concave, being distinctly nearer it than your Barstow, California, female." The San Bartolo female here recorded is, therefore, almost exactly similar. We believe therefore that *parviceps* is based on a specimen from the southern extremity of Lower California, the condition there found being discussed below. The type of *parviceps* is a female, measuring as follows: "length of body (somewhat shrunken) 23.5, length of pronotum 4.8, length of tegmen 20, length of caudal femur 12 mm."

It was this insect which in 1923 we reported as *californicus* from numerous localities in Lower California, the Gulf of California and Sonora.

East of Sierra San Pedro Martyr, II, 25, 1930, (in sandy gulch), 1 juv. ♀.

La Paz, III, 28, 1930, (on sandy desert), 1 ♂, 1 ♀.

We have also before us one female from Calamujuet, two females from San Fernando and one male from Santa Margarita Island, taken by C. D. Haines in 1889.

The following material averages much smaller with fastigium averaging narrower than in any series of the species we have seen from other portions of its distribution. Re-examination

of the series reported by us in 1923 shows this to be true for all of that material taken from Monserrate Island to San José del Cabo and we have besides five males and fourteen females taken at the latter locality by G. Eisen which similarly agree. There is sufficient individual variation, however, to lead us to believe that, though incipient racial differentiation is indicated, this has not progressed sufficiently to warrant racial recognition. Thus *aridus* falls as a synonym, which name would have been available for the condition developed in the central portion of Lower California and in the United States were that racially separable.

San Bartolo, IV, 3, 1930, 1 ♀.

Near San Antonio, eastern foot of Sierra de la Victoria, IV, 3, 1930, (in shady gully), 1 ♂.

Cape San Lucas, III, 30 and 31, 1930, 3 ♂, 8 ♀.

Heliastus californicus (Thomas)

This insect is confined to the Pacific slope in southern California and northern Lower California. It is quite as variable as *parviceps*, which makes its status, whether a race or a distinct species, a difficult matter to decide.

From a considerable series before us it is seen to be distinguished by the broader form, proportionately shorter organs of flight and caudal femora, average broader vertex and usually (but not invariably) more roughened dorsal surface of the pronotum.

Hamilton's Ranch near Santo Domingo Mission, II, 15, 1930, (on reddish gravel), 3 ♀; II, 16, 1930, (500 feet above sea level on reddish decomposed rock and gravel), 1 juv. ♀.

These specimens have the pronotal disk very much more scabrous than in any of our series from the Los Angeles region in California. Were it not for the fact that they are red brown, and that a considerable series of *parviceps* from Winslow, Arizona, of that color has the pronotal disk also decidedly rougher than in any of the many other series of that species we have examined, we would be at a loss to account for so marked a structural difference unless taken as an index of specific or racial differentiation. As it is, we believe that we have proof that in these species the adaptation of their surface to the red brown of their environment is accompanied by a decided roughening

of the pronotal surface as well, representing an individual structural differentiation in a way analogous to the presence or absence of supplementary pronotal carinae in different color phases of the same species of the genus *Amphitornus*.

BATRACHOTETRIGINAE

Tanaocerus rugosus new species (Pl. XXII, fig. 3)

Comparison with a female paratype of *T. koebelei* Bruner in the author's collection, taken in the Panamint Valley of California, April, 1891, by A. Koebele, shows that the female sex of the present species differs in the shorter head, shorter eye, much wider fastigio-facial production between the antennal sockets, much roughened fastigium, occiput, pronotum, mesonotum, metanotum and first two abdominal tergites and much shorter ovipositor valves with their apices more curved.

The enormously long filiform antennae developed in this genus much more strongly suggest those of the Tettigoniidae than do those of any other Acridid genus known to us.

Type.— ♀ ; Mesa top fifty four miles southwest of El Marmol, Lower California. March 10, 1930. (Newbold and Morris.) [Acad. Nat. Sci. Phila., Type No. 5497.]

Small size and stout body much as in *koebelei*. Occiput rugose, raised meso-caudad, with broad sulci before the carinae bounding the inner margins of the eyes and continued as the lateral carinae of the vertex without interruption, there suddenly curved outward to join the lateral carinae of the frontal costa which are very strongly convergent, then suddenly becoming vertical at that point with short convergent carinae which do not meet but partially indicate the definition between fastigium and frontal costa. The latter areas concave, the frontal costa between the antennal sockets slightly broader (in paratype slightly narrower) than the first antennal joint and just below the antennal sockets the frontal costa suddenly disappears into the face. Eye in length equal to interocular width. Antenna decidedly over twice combined length of head and pronotum (in *koebelei* longer than as described by Bruner, fully twice combined length of head and pronotum). Pronotum with numerous nodes and sinuous rugae, symmetrically arranged; the metanotum broadly bilobate, produced on each side with margins there cingulate, this weakly indicated in *koebelei*. Mesonotum and metanotum, like pronotum, with nodes and rugae, the first two abdominal tergites weakly so. Organs of flight absent. A rounded triangular flap present on each side beyond the small

rounded conical cerci, this flap decidedly smaller than in *koebelei*. Ovipositor valves short, with short sharp teeth, the apices short and moderately curved. Limbs with carinae moderately heavy and feebly irregular.

General coloration mummy brown, the type tinged with prouts brown. Caudal femora slightly paler with two bands and genicular areas mummy brown. Antennae with the first two large joints of the general coloration, the others (very elongate) alternating black and buffy with the (ten to twelve) apical joints dark brown. Limbs with pale hairs. Caudal tibiae light brown suffused and flecked with dark brown; caudal tarsi buffy with a greenish tinge.

The measurements of a paratypic female follow those of the type. Length of body 17.2 and 15.7; length of antenna 13.8 and 12.4; length of pronotum 3.2 and 2.8; length of caudal femur 9.4 and 8.7; width of caudal femur 1.9 and 1.8 mm.

For comparative purposes we give the measurements of the female paratype of *koebelei*. Length of body (estimated as in normal position; extruded and given by Bruner as 23) 18.5, length of antenna 13.5, length of pronotum 3.7, length of caudal femur 10, width of caudal femur 2.6 mm.

Specimens Examined: 4; 3 females and 1 large immature female.

Mesa top fifty four miles southwest of El Marmol, 1000 feet, III, 10, 1930, 1 ♀ *type*, 1 large juv. ♀.

Santa Caterina Beach, fifty two miles west of El Marmol, III, 13, 1930, (in brushy area), 2 ♀ *paratypes*.

PYRGOMORPHINAE

Calamacris mexicana Bruner

1906. [*Calamacris*] *mexicana* Bruner, Biol. Cent.-Amer., Orth., II, p. 200, No. 3, pl. 4, fig. 26. [♀; Patrocino, Lower California.]

1906. [*Calamacris*] *oculata* Bruner, Biol. Cent.-Amer., Orth., II, p. 200, No. 5. [♂; extreme southern Arizona.]

Careful comparison of the types of *mexicanus* and *oculatus* with the present male and immature specimens recorded by us in 1923 shows beyond question the synonymy here published. The type of *oculatus* is a dried alcoholic specimen labelled roughly "Arizona," certainly in error.[4] It was probably secured by G. Eisen in southern Lower California, much of whose material

[4] After years of field work on the border of the Southwestern United States we are convinced that the genus *Calamacris* does not occur so far north; mislabelling of the unique type of *oculatus* explains why it has ever been so recorded.

which Bruner studied (including the original series of *mexicanus*) was taken in that region.

Cape San Lucas, III, 30, 1930, 1 ♂.

Males of this little known species may be separated from those of *C. californicus* Bruner, known only from San José del Cabo, Lower California, by their more slender form, more produced fastigium, narrower interocular space, presence of minute vestigial tegminal pads and weak carinae on the thoracic and proximal abdominal tergites.

CYRTACANTHACRINAE

Litoscirtus insularis Bruner

Western slopes of Sierra San Pedro Martyr, 2000 feet, II, 25, 1930, 1 ♂.

Not only is this the first male but also the first well preserved specimen[5] to be studied of this handsome and extremely distinctive species. It agrees closely with the female, differing in being considerably smaller with pronotal cristation lower and less incised.

The natural colors are as follows. General coloration mummy brown, becoming mars brown to a large extent laterad, the tegmina delicately and not strikingly marbled with a paler shade. Caudal femora and tibiae laterad cinnamon drab, the former with darker flecks and two very faintly suggested dorsal bands. Caudal tibiae elsewhere paler, vinaceous buff. Internal half of ventral surface and all but brief distal and very narrow dorsal portion of internal surface of caudal femora shining black. Abdomen cinnamon, thickly marbled with bister dorsad and laterad. Wings vitreous, tinged with pale turquoise green, apices heavily suffused with mummy brown, veins mummy brown.

Length of body 26.8, length of pronotum 7.4, dorsal width of pronotum 4.8, length of tegmen 25.2, length of caudal femur 14.2 mm.

It is plainly evident that the venation, marking and coloration of the wings strongly indicate that there is much closer affinity to the desert dwelling *Tytthotyle maculata* Bruner of the southwestern United States than has been supposed.

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[5] The three previously known specimens are all dried alcoholic females.

Dracotettix newboldi new species (Pl. XXII, figs. 5, 6, 7)

This is the smallest, slenderest and smoothest of the species of this very remarkable genus. It is further distinguished from the three previously described Californian species by the lower pronotal crest, much more elongate organs of flight, caudal femora internally black only in ventro-proximal portions and caudal tibiae light bluish gray with internal surface light blue, the spines distinctively tricolored.

Type.—♀; Hamilton's Ranch near Santo Domingo Mission, Lower California. February 15, 1930. (C. B. Newbold.) [Acad. Nat. Sci. Phila., Type No. 5496.]

Size smaller, form decidedly more slender than in the other species of *Dracotettix*. Fastigium sub-rectangulate, production broader than long, slightly shorter but nearest that of *D. plutonius* Bruner, its dorsal surface impressed but caudad with a faint medio-longitudinal carina which becomes strong on the occiput. Pronotal crest low, much as in *plutonius* except that it is more even, the three divisions on the prozona and that on the metazona of almost equal height, the latter evenly subsiding caudad. Surface of pronotum much smoother than in that species, with lateral carinae less distinctly divergent caudad beyond the first sulcus; angle formed by metazonal production decidedly less instead of distinctly less than a right angle, in this feature more like *D. monstrosus* Bruner and *D. californicus* Bruner. The tegmina and wings extend slightly beyond the bases of the genicular areas of the caudal femora, leaving exposed distal portion of abdomen. They are decidedly longer than caudal femur though the insect is clearly incapable of flight. Ovipositor valves slightly shorter with dorsal apices more curved than the average in the other species. Limbs as in the other species but appearing generally smoother, the caudal femora with dorsal carina armed with minute serrations, such suggested on the dorso-lateral carinae.

Allotype.—♂; same data as type but taken February 16, 1930. [Acad. Nat. Sci. Phila.]

Very similar to female but much smaller and more slender. Tegmina and wings proportionately decidedly more caudate, extending almost to apices of caudal femora and slightly surpassing apex of abdomen. Fastigium acute-angulate produced, longer than broad, slightly longer and more acute than in *plutonius*.[6] Pronotal cristation like that of female, but propor-

[6] As shown by male paratype of *plutonius* in the author's collection.

Explanation of Plate XXII

Fig. 1. *Yersiniops newboldi* new species. Below Todos Santos, Lower California. *Type.* Female. Cephalic outline of head. (× 9)

Fig. 2. *Horesidotes cinereus saltator* new subspecies. Tia Juana, California. *Type.* Male. Lateral view. (× 3)

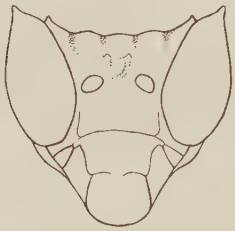
Fig. 3. *Tanaocerus rugosus* new species. Mesa fifty four miles southwest of El Marmol, Lower California. *Type.* Female. Cephalic outline of head. (× 12)

Fig. 4. *Tanaocerus rugosus* new species. Mesa fifty four miles southwest of El Marmol, Lower California. *Type.* Female. Dorsal view. (× 3)

Fig. 5. *Dracotettix newboldi* new species. Hamilton's Ranch, Lower California. *Allotype.* Male. Dorsal outline of head. (× 6)

Fig. 6. *Dracotettix newboldi* new species. Hamilton's Ranch, Lower California. *Type.* Female. Dorsal outline of head. (× 6)

Fig. 7. *Dracotettix newboldi* new species. Hamilton's Ranch, Lower California. *Type.* Female. Lateral view. (× 2)



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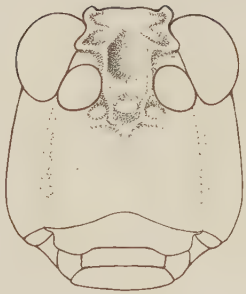

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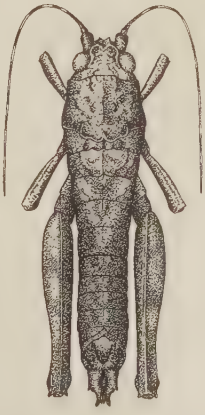

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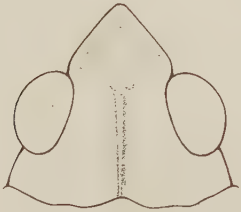

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HEBARD LOWER CALIFORNIAN ORTHOPTERA

NEW NEOTROPICAL ANDRENOSOMA

(DIPTERA: ASILIDAE)

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Since it has been shown by Miss Ricardo[1] that *Nusa* Walker and *Dasythrix* Loew are congeneric and that *Nusa* has priority, our *Laphriinae* hitherto placed in *Nusa* by American writers must be referred to *Andrenosoma* Rondani, with the genotype *A. atrum* (Linnaeus), by which they are congeneric.

A re-definition of the genus would no doubt be helpful, as little mention of the stable characters of the genus has been made in literature. The closure of the first posterior cell is a variable character as is the enlargement of the femora and the arcuation of the posterior tibiae, as McAtee has pointed out.[2]

Characters I have found constant in the genus are as follows:

1. The pointed proboscis, slightly upturned, as seen in profile.
2. The rather flattened, truncate, distal segment of the palpus.
3. The well-developed facial prominence.
4. The hairy and bristly head and legs, the latter stout.
5. The mesonotum with pruinose spots, sometimes, however almost obsolete.
6. The slender, eversible, tubular oviduct in the female.
7. The small hypopygium in the male with short forceps, not enlarged as in *Laphria*.

In collections of Asilidae loaned from the British Museum (through the courtesy of Major E. E. Austen); from the Hamburg Museum (through the courtesy of Dr. O. Kröber); from the Museum of Comparative Zoology (through the courtesy of Professor N. Banks); and from the Philadelphia Academy of Sciences (A. N. S.) (through the courtesy of Mr. E. T. Cresson, Jr.), a number of new species of this genus abundant in the neotropical region were found and are herewith described.

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[1] Annals and Magazine of Natural History, Ser. 9, vol. xx, p. 205, August, 1927.

[2] Notes on the Nearctic Nusa: Ohio Journal of Science, vol. xix, No. 4, February, 1919.

Thanks are due the above named for their kindness in allowing the loan and study of the collections. The types are to be deposited in the various collections from which the specimens were drawn.

Andrenosoma minos new species

Length, 26 to 28 mm. (exclusive of proboscis which is 4 mm. in length). A large black species with metallic blue and purplish reflections. Wings black. Beard, lower part of mystax, hairs on coxae and bloom on lower part of pleura, white.

Male. Proboscis long and sharply upturned at tip, black. Antennae, palpi, palpal hairs, bristles and hairs of vertex and occiput, upper bristles of mystax, black. Thorax black with bluish reflections on mesonotum. Scutellum metallic blue-black. Pleura with whitish bloom. A patch of similarly colored bloom back of humerus and also on the posterior margin of the mesonotum. Halteres pale brownish with lighter knobs. Legs black with metallic purplish lustre. Most of the hairs and bristles black, but there is long, fine white pile intermingled, particularly on the femora. The undersides of the tarsi have fine golden-brown thickly set, short hairs. Abdomen, black with purplish lustre; hairs and bristles black. Genitalia dark brown.

Holotype.—♂; River Amazon, Brazil, (H. W. Bates; (65–3)). *Paratypes.*—1♂; Amazon, Brazil, (ex. coll. W. W. Saunders; (68–4)). 1♂, Ecuador, (Purch. of Buckley (80–126)). [All in British Museum.]

An attempt was made to identify this species with *Laphria olbus* Walker, which Herman considered a *Nusa.* The difference in size, however, would not encourage this classification. Walker's rather general description might apply to species of *Lampria,* also.

Andrenosoma lupus new species

Length, 26 mm. A dull black, less robust species, with white pile and bloom on head, thorax and base of abdomen, giving it a grayish appearance. Wings dark brown, basal fourth hyaline.

Male. Head black with fine white hairs and bloom. Most of bristles of mystax black. Palpal hairs black. Beard whitish. Thorax black with white hairs and bloom. On mesonotum the light bloom forms three median stripes. Hairs on mesonotum black. Scutellum dull black with black bristles. Legs black with black and white pile intermingled. Halteres dark brown

with pale knobs. Abdomen black with a grayish bloom. Genitalia brownish black. Abdomen with many fine white hairs, more numerous toward the base.

Holotype.—♂; Ega, Amazonas, Brazil, (H. W. Bates; (66–50)). [British Museum.]

Andrenosoma heros new species

Length, 28 to 29 mm. (exclusive of proboscis which is 3.5 mm.). A large robust black species with grayish pollinose markings on the thorax, the tip of the abdomen from the sixth segment on. red; and the legs, coxae and head with long, pale yellow vestiture.

Male. Head black. Palpi, palpal hairs, antennal hairs, a few bristles on vertex, occiput and upper part of mystax, black. Rest of vestiture of head, pale yellowish. Thorax black with the grayish pollinose markings characteristic of this genus. Hairs and bristles of disc of mesonotum and scutellum black. Hairs of pleura, legs and coxae, long, fine and yellowish white. Some black hairs and bristles on tibiae and tarsi. Underside of tarsi and apex of front tibiae with thickly set, closely appressed, golden-brown hairs. Wings hyaline with areas adjoining veins brownish. First posterior cell open. Abdomen black with whitish yellow hairs on the sides of segments one to three. Segments six and following, red with reddish hairs. Genitalia reddish with concolorous hairs. Venter with long yellowish white pile.

Female. Similar, but hairs paler. Oviduct long (3 mm.), eversible, as is characteristic of this genus.

Holotype.—♂; Demerara, Surinam, (Ehrhardt vend.), [Hamburg Museum]. *Allotype,* ♀; Obidos, Para, Brazil, (M. de Mathan; 1915–425). [British Museum.]

Andrenosoma subheros new species

Length, 18 to 23 mm. Similar to the preceding, but smaller, more slender, the light pile white instead of yellowish-white, as well as being more sparse. Venter of abdomen with black pile.

Male. Mystax mostly black; the pale vestiture of head whitish. Thorax as in *heros,* as are the wings and legs. The pile on the thorax sparser and lighter colored than in *heros.* Abdomen with segments six and following red with reddish hairs. Processes of genitalia pointed rather than obtuse as in *heros.* Venter with fine black pile and fine white pile anteriorly, but sparser and lighter than in *heros.*

Female. Similar, but oviduct is brownish.

Holotype.—♂; Santa Cruz, Rio Grande do Sul, Brazil, (Fr. Stieglmayr leg. vend.; 10. VII. 1895), [Hamburg Museum]. *Allotopotype*, ♀; *Paratopotype*, ♂; *Paratypes*, 1 ♂, Espirito-Santo, Brazil, (ex. coll. Fruhstorfer). 1 ♀, Espirito-Santo, Brazil, (J. Michaelis vend.; 22. IV. 1898), [all preceding in Hamburg Museum]. 1 ♀, Manaos, Brazil, (Mann & Baker. Ex. coll. C. W. Johnson), [M. C. Z.].

Both this species and *heros* have the tip of the proboscis broad and slightly notched, viewed from above.

Andrenosoma nigrum new species

Length, 18 to 19 mm. A robust, dull black species.

Female. Entirely dull black with thorax, occiput and face dull brownish pollinose. Wings and vestiture black. Halteres black. Oviduct short, dark brown, with brownish hairs.

Holotype.—♀; Guayaquil, Ecuador, (96–119), [British Museum]. *Paratopotype*, ♀, (R. Paessler leg. 13. VI. 1910 ded. 5. IX. 1910), [Hamburg Museum].

Andrenosoma rufum new species

Length, 21 to 25 mm. Allied to *Andrenosoma varipes* Banks, but almost entirely reddish. Abdomen much narrower than thorax.

Male. Proboscis, palpi, vertex, occiput black. Palpal hairs, bristles of upper mystax, vertex and occiput, black. Beard, lower mystax and hairs of face, white. Facial prominence, red. Thorax reddish. Pleura whitish pollinose. Two median stripes and two lateral spots on each side on mesonotum, black. Scutellum red with black marginal bristles. Legs red with black bristles, and black and white hairs intermingled. Tips of femora black. Ungues black. Wings pale brownish, lighter at base. Halteres pale brownish. Abdomen red, segments three to five darker at sides. Genitalia reddish with some hairs black.

Holotype.—♂; Santo Domingo, (Coll. by Tweedie; (55–1)). *Paratopotype*, ♂; (56–1). [Both in British Museum.]

Andrenosoma batesi new species

Length, 14 mm. A small, black species with grayish stripes on the mesonotum, whitish spots on the abdomen and nearly hyaline wings with tips pale brownish.

Male. Head black, proboscis short. Palpal hairs, antennal, ocellar, occipital bristles and a few in center of mystax black. Rest of head thickly whitish pilose. Thorax black, whitish pollinose, mesonotum with three broad whitish pollinose bands. Scutellum whitish pollinose with black marginal bristles. Legs black with long white pile. A few black bristles and hairs. Wings hyaline, slightly grayish distally. Abdomen black with a slight bluish lustre. Second and third segments with grayish-white lateral spots posteriorly and segments four and five with a whitish band posteriorly. Pile on the light areas white. Sixth segment mostly whitish with concolorous hairs. Genitalia dark brown with whitish hairs.

Holotype.—♂; River Amazon, Brazil, (H. W. Bates; (66–53)). [British Museum.]

Andrenosoma currani new species

Length, 14 mm. A robust, distinctive, black species with abdomen golden-brown pruinose, with brown incisures. Wings yellowish. Beard and mystax mostly golden-brown.

Male. Head black, pale brownish pollinose. Mystax (except a few black bristles in upper portion), palpal hairs, beard, antennal and ocellar bristles golden brown. Occipital and genal bristles black. Thorax black. Pleura whitish and pale golden pollinose. Mesonotum with golden-brown pollinose markings. Scutellum black with black bristles, golden-brown at base. Legs black with golden-brown bristles and hairs. Wings pale yellowish brown, darker at tips. Abdomen black with fine hairs above golden-brown. Incisures broadly golden-brown. Genitalia light brownish with concolorous hairs.

Holotype.—♂; Santa Cruz, Rio Grande do Sul, Brazil, (Fr. Stieglmayr leg. vend.; 10. VII. 1895), [Hamburg Museum].

Andrenosoma flamipennis new species

Length, 16 to 18 mm. A dull black species with reddish wings, brown at tips.

Male. Head black with black vestiture, except beard and ocellar bristles which are golden-brown. Thorax black with the usual pruinose markings. Bristles and hairs of mesonotum and scutellum reddish. Legs black with reddish brown hairs and bristles. Wings reddish, distal fifth blackish brown. Abdomen black with fine reddish hairs; some black hairs intermingled. A small patch of white hairs on sides of segments 2 to 4. Genitalia piceous with black hairs.

Female. Similar. Oviduct blackish, brownish at base.

Holotype.—♂; Bartica, British Guiana, (5. VI. 1901; R. J. Crew), [A. N. S.]. *Allotype,* ♀; Caura Valley, Venezuela, (ex. coll. C. W. Johnson), [M. C. Z.]. *Paratypes,* 1 ♀; (headless) Demerara, Surinam, (Ehrhardt vend.), [Hamburg Museum]. 1 ♂, Santos, ? Brazil, (J. Metz leg.; ded. 30. V. 1894), [Hamburg Museum].

This species is related to *A. rufipennis* (Wied.) from which it differs in having the abdomen entirely black. *A. proxima* (Walker) is a related species, having the abdomen "wholly tawny and the wings luteous for not more than two-thirds of the length."

THE MOGOPLISTINAE (ORTHOPTERA, GRYLLIDAE) OF THE UNITED STATES

BY MORGAN HEBARD

(Plates XXIII–XXIV)

In 1912[1] Rehn and Hebard published on these insects, including all the material they had from North America south to Panama. Since that time much more material has been received and a number of tropical American species have been described. One genus there described, *Glaphyropus*, is known to be a synonym of *Cycloptiloides* Sjostedt; that genus, erected to include an African species, having been described in a paper which did not reach us until after our paper had appeared.

We find we have now sufficient material to revise fully the forms of the United States; represented by three genera, nine species and two geographic races.

Much yet remains to be done to fully delimit the areas of distribution, particularly of the races here recognized of *Cycloptilum comprehendens*, but we believe that little new will subsequently be found in the United States. The species to the south of this country are far more difficult and less well understood, and we plan to treat them from time to time as new faunistic papers are prepared.

In the present study seven hundred and thirty-nine specimens are recorded, and in addition over five hundred from the same region, previously correctly reported, have been examined. Additional material is particularly needed from Oklahoma, northern New Mexico and Arizona, southern Nevada and southern California. So small are these nocturnal insects that they are very apt to be overlooked by the collector and it is for this reason that, though probably moderately abundant through the regions mentioned above, enough material has not yet been secured there.

[1] Proc. Acad. Nat. Sci. Philadelphia, 1912, pp. 184 to 234.

Key to the Genera here Treated

Dorsal margins of caudal metatarsus serrate or serrulate. Interantennal protuberance not deeply divided.

A. Cephalic tibiae without auditory foramina. Both sexes apterous. Caudal metatarsus very feebly serrulate. (Apex of ovipositor at its base wider than shaft, sublanceolate.) (Southern Florida.)
Oligacanthopus Rehn and Hebard

AA. Cephalic tibiae with a large auditory foramen on cephalic face. Male with tegmina present. Caudal metatarsus more strongly serrulate or serrate.

B. Apex of ovipositor at its base wider than shaft, sublanceolate. Pronotum of male produced caudad so that the tegmina are wholly concealed from above or only their distal portions are visible from that angle. Caudal metatarsus of approximately subequal width beyond base, its dorsal margins serrulate. (Southern half of United States.)
Cycloptilum Scudder

BB. Apex of ovipositor no wider than shaft. Pronotum of male little produced caudad, so that only the proximal portions of the tegmina are covered. Caudal metatarsus broadest beyond base, thence narrowing to apex, its dorsal margins serrate. (Southwestern United States.)
Hoplosphyrum Rehn and Hebard

Our work has been greatly facilitated by the fact that, in reply to our requests, all of the material at the United States National Museum, the University of Michigan, the University of Kansas and from the Davis Collection has been sent for study. We have also received a few other important specimens from other Institutions. Material taken by Rehn and Hebard belongs to the Academy of Natural Sciences of Philadelphia or to the author's collection there deposited.

Oligacanthopus prograptus Rehn and Hebard

1912. *Oligacanthopus prograptus* Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1912, p. 219, figs. 21 to 23. [♀; Miami, Florida.]

1915. *Oligacanthopus prograptus* Hebard, Ent. News, xxvi, p. 462, pl. 18, figs. 2a and 2b. [♂, ♀, juvs.; Miami, Florida.]

In 1915 discovery of the male showed that in this very extraordinary genus that sex was also apterous and very similar in general appearance to the female.

The four vertical dark bars on the vertical face of the interantennal protuberance constitute the most striking of the color characters. The scale covering is much heavier than in *Cycloptilum* and gives a definitely silvery appearance, mottled and speckled with dark brown.

Specimens Examined: in addition to large series previously reported; six; 1 male, 1 female and 4 immature individuals.

FLORIDA: Miami, XI, 27, 1912, (F. Knab), 1 small juv., [U. S. N. M.]. Brickell's Hammock, Miami, II, 25 to III, 4, 1916 and 1919, (Hebard; under bark of trees noted below), 1 ♀ (on II, 28th), 3 juv. ♀. Royal Palm Key, III, 3, 1917, (Hebard; under loose bark of tree, *Exothea paniculata*, in jungle), 1 ♂.

The insect is nocturnal and during the day hides under loose patches of bark on trees in and near the tropical "hammocks," those most frequented being *Exothea paniculata* and *Coccolobus laurifolia.*

In 1916 we extended the known distribution to the West Coast of Florida, by finding a specimen under the bark of *Exothea paniculata* on Captiva Island at Captiva Pass.

Though, if located, series can be obtained by hard work, we consider this one of the rare species of tropical Florida.

Cycloptilum Scudder

1868. *Cycloptilum* Scudder, Proc. Boston Soc. Nat. Hist., XII, p. 142.

Genotype: *C. squamosum* Scudder (by monotypy).

In 1912 Rehn and Hebard proposed *Cryptoptilum* for related forms in which the male tegmina were wholly concealed from above by the pronotum. Additional species since discovered show the pronotum produced in widely varying degree and we agree fully with Blatchley, who in 1920 placed *Cryptoptilum* as a synonym.

The genus *Cycloptilum* is very close to *Ectatoderus* Guérin 1849 and better knowledge of the species of the Old World may oblige its being placed as a synonym. Examination of a male of *Ectatoderus kilimanjaricus* Sjostedt,[2] a species closely related to the genotype *Ectatoderus nigriventris* Guérin from Abyssinia, shows it to differ from all American species of *Cycloptilum* in the following respects.

Palpi with third, fourth and fifth joints elongate, third slightly longer than fourth, fifth considerably longer than third. Cephalic tibiae of equal width, showing no swelling whatever. Male concealed genitalia hardly projecting; two processes present as in the American species but these shorter, heavier and more rounded than in those species.

[2] From Kiboscho, Kilimanjaro, taken in March by Alluaud and belonging to the Paris Museum. We have received this specimen for the present comparison through the kindness of Dr. L. Chopard.

The male pronotum is greatly produced, but this degree of production is equalled in the South American *Cycloptilum thoracicum* Hebard. In all other features which could have generic value close similarity between *kilimanjaricus* and the New World species of *Cycloptilum* is found.

The following key gives only the features of greatest value in separating the forms of *Cycloptilum* found in the United States. Other features which aid in distinguishing these are considered under the discussions here given.

A1. Size larger (length of body 6.5 to 8.5 mm.). Male tegmina completely concealed from above by the pronotum. (Female subgenital plate without projections.)

B1. Terminal palpal joint elongate, evenly and weakly expanding distad, so that ventral margin is decidedly greater than apical diameter. Form more robust. Southeastern (coastal North Carolina to Mexican border).
antillarum (Redtenbacher)

BB1. Terminal palpal joint shorter, evenly and strongly expanding distad, so that ventral margin is equal to apical diameter. Form more slender. Southeastern (Maryland to eastern Texas).
trigonipalpum Rehn and Hebard[3]

AA1. Size smaller (length of body 4.9 to 7.2 mm.). Male tegmina with distal portion projecting as a broad margin or very broadly beyond caudal margin of pronotum.

B2. Female subgenital plate without projections, its disto-lateral angles broadly convex.

C1. Male pronotum moderately produced caudad, with caudal margin broadly convex. Pronotum normally immaculate; if paired darker areas are indicated cephalad, these are very weak and vague.

D1. Male pronotum usually distinctly less ample. Male tegmina strikingly marked with blackish brown. Size averaging smaller. (Extreme southern Florida.)
zebra (Rehn and Hebard)

DD1. Male pronotum distinctly more ample (as in *squamosum* and *bidens*). Male tegmina immaculate or weakly marked with brown. Size averaging larger. (South central United States and along Gulf Coast to Cedar Keys, Florida.) . . . . . *squamosum* Scudder

[3] The Haytian *C. contectum* (Rehn and Hebard) is much the closest known relative of this species.

CC1. Male pronotum decidedly produced caudad and with caudal margin more convex than in any other species here treated. Pronotum with heavy paired dark markings cephalad. (Extreme southern coastal California.) . . . . . *distinctum* new species

BB2. Female subgenital plate with disto-lateral angles produced. (Pronotal form much as in *squamosum*.)

C2. Female subgenital plate with very minute sharp projections disto-laterad, between which emargination is shown. Male tegmina strikingly marked with blackish brown. Pronotum immaculate. Form more graceful. Southeastern (Long Island, New York to central Louisiana). *bidens* new species

CC2. Female subgenital plate with decided projections disto-laterad. Male tegmina immaculate or very feebly marked. Pronotum with heavy paired dark markings cephalad, sometimes becoming weak and occasionally obsolete. Form more robust.

D2. Latero-caudal projections of female subgenital plate triangular, no longer than wide, with rounded apices. (Southern Great Basin.) *comprehendens interior* new subspecies

DD2. Latero-caudal projections of female subgenital plate produced in flat fingers, much longer than wide.

E1. Latero-caudal projections of female subgenital plate decidedly broader and widening much more strongly toward base. (Southwestern Texas to southeastern California.) . . . . . *comprehendens fortior* new subspecies

EE1. Latero-caudal projections of female subgenital plate very slender. (Southwestern Nebraska to Mexican line and Farmington, New Mexico.) *comprehendens comprehendens* Hebard

Two groups are represented, which we designate as the Antillarum and the Squamosum Groups; distinguished as indicated in sections A1 and AA1 of the present key. In the American tropics are numerous species of the former and many suggest the latter but may belong to an allied group, while still another very distinct group is represented by the Colombian *C. thoracicum* Hebard.

Cycloptilum antillarum (Redtenbacher)

1892. *E*[*ctatoderus*] *antillarum* Redtenbacher, Proc. Zool. Soc. London, 1892, p. 218, pl. 17, figs. 16a, 16b. [♂, ♀; St. Vincent, West Indies.]

1912. *Cryptoptilum antillarum* Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1912, p. 196, figs. 5 to 8.

There are only the following notes and additional records to add to the diagnosis and figures given by Rehn and Hebard. Since then the author has recorded the species from Panama.

Comparison of series shows *antillarum* to average larger and heavier than *trigonipalpum*, with the abdomen less extensively black and less shining and the cerci and ovipositor shorter in proportion to the body length. The abdomen is of course only as noted above when the scale-covering has been rubbed off, but this is very frequently the case in museum specimens, particularly of *trigonipalpum*. The much longer and much less expanded ultimate palpal joint of *antillarum* affords, however, the most striking difference from *trigonipalpum*.

We now know that the distribution of this insect extends along the ocean shore from Beaufort, North Carolina to the Mexican Boundary and through the Florida Keys and the Dry Tortugas.[4] It occurs inland very rarely, such records being Florence, South Carolina; Gainesville and Haines City, Florida, and Wellborn and Flatonia, Texas.

Specimens Examined (in addition to very large series previously correctly recorded): 161; 65 males, 67 females and 29 immature individuals.

GEORGIA: Tybee Island, VII, 26, 1913, 1 ♂, 1 large juv. ♂, 1 large juv. ♀, [Hebard Cln.].

FLORIDA: Pomona, IX, 1, 1917, (Rehn; on palmetto leaf in flat woods), 1 ♀. Gainesville, VIII, 1926, (T. H. Hubbell), 1 large juv. ♀, [Univ. of Michigan Cln.]. Cedar Keys, VII, 22, 1923, (F. W. Walker), 1 ♂, [Univ. of Michigan Cln.]. DeLeon Springs, IX, 8, 1917, (Rehn and Hebard; beaten from undergrowth in lofty oak hammock), 1 ♂, 1 ♀. Haines City, VIII, 21, 1925, (T. H. Hubbell), 1 ♂, [Univ. of Michigan Cln.]. Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (Rehn and Hebard; few in dense growth of bayberry and other shrubs), 1 ♂, 3 ♀. Cortez Beach, Manatee County, VIII, 24, 1925, (T. H. Hubbell), 12 ♂, 19 ♀, 3 juv. ♂, 3 juv. ♀, [Univ. of Michigan Cln.]. Manatee, VIII, 24, 1925, (T. H. Hubbell; in weedy thicket bordering marsh), 1 ♀, [Univ. of Michigan Cln.]. Snead's Island, Manatee County, VIII, 20, 1925, (T. H. Hubbell; in Cabbage Palmetto and oak hammock), 3 ♂, 1 juv. ♂, 3 juv. ♀, [Univ. of Michigan Cln.]. Lee County, VIII, 28, 1923, (Walker and Alexander), 2 ♂, [Univ. of Michigan Cln.]. Brickell's Hammock, Miami, III, 5, 1920, (Hebard; beaten from heavy hammock undergrowth), 1 ♀; III, 4, 1916, (Hebard; on mangrove in mangrove swamp), 1 ♀. Western end of Long Island, Biscayne Bay, III, 5, 1922, (Hebard), 1 ♀. Crevallo, VIII, 9, 1930, (P. W. Oman), 1 ♂, 3 ♀, [Univ. of Kansas]. Key Largo, VIII, 9, 1930, (R. H. Beamer), 9 ♂, [Univ. of Kansas]. Cape Sable,

[4] See notes by Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1914, p. 410.

II, 28, 1919, (W. S. Blatchley), 1 ♂, [Hebard Cln.]. Carrabelle, IX, 2 and 3, 1915, (Rehn; beaten from bushes on tidal salt marsh), 4 ♀. Pensacola, VIII, 29, 1915, (Hebard; from gall-berry bushes in Long-leaf Pine woods), 1 ♀. Fort Barrancas, VIII, 28, 1915, (Rehn; beaten from scanty undergrowth in sand area), 1 ♂, 3 ♀, 3 juv.

Alabama: Springhill, Mobile County, VIII, 25, 1915, (Rehn; beaten from heavy bushes in dense oak forest), 1 ♂.

Mississippi: Pass Christian, VIII, 23, 1915, (Rehn and Hebard; sweeping in pine woods), 1 ♀.

Louisiana: Rhoda, St. Mary Parish, VIII, 8, 1915, (Rehn and Hebard; from swamp area about pond), 1 ♀, 1 juv. ♀. Lafayette, VIII, 9, 1915. (Rehn and Hebard), 3 ♂, 2 ♀, 3 small juv.

Texas: Sabine, VIII, 11, 1915, (Rehn and Hebard; moderately common in marsh grass on tidal flats), 5 ♂, 3 ♀, 3 juv. ♀. Houston, VIII, 12, 1915, (Rehn and Hebard; from spanish moss on oak), 1 ♂. Flatonia, VIII, 20, 1912, (Rehn and Hebard; from dense tangle of vines and weeds in stream bottom), 4 ♂, 3 ♀. Victoria, VII, 26 and 27, 1912, (Rehn and Hebard; very common in tangle of vines growing in tall weeds in stream-bottom forest), 9 ♂, 7 ♀, 4 juv. Brownsville, VII, 31 and VIII, 1, 1912, (Rehn and Hebard; beaten from vines and high weeds in river bottom), 4 ♂, 8 ♀, 2 juv. ♀; VIII, 3, 1928, (Beamer and Shaw), 1 ♂, 2 ♀, [Univ. of Kansas Cln.]. Piper Plantation near Brownsville, VIII, 3, 1912, (Rehn and Hebard), 3 ♂, 2 ♀.

Cycloptilum trigonipalpum (Rehn and Hebard)

1912. *Cryptoptilum trigonipalpum* Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1912, p. 204, figs. 11, 12, 15 and 16. [♂, ♀: type locality, Isle of Hope, Georgia.]

This insect has the caudal tibiae and tarsi more slender and delicate than in *antillarum*. Other differences are noted under that species.

The range of *trigonipalpum* is now known to reach from Bay Ridge, Maryland to Key Largo, Florida on the Atlantic Coast and the Bahamas, extending far inland of that of *antillarum* and reaching as far as Petersburg, Virginia; Weldon, North Carolina; Columbia, South Carolina; (north to) Stone Mountain and Warm Springs, Georgia; Dothan, Montgomery and Selma, Alabama; Strickton and Natchez, Mississippi; West Monroe and Arcadia, Louisiana, and Doucette, Texas, the last being the known westernmost point as well. Other material was recorded from within this range by Rehn and Hebard in 1914 and by Hebard in 1915 and 1916.

Specimens Examined, in addition to many previously correctly recorded: 159; 43 males, 40 females and 76 immature individuals.

MARYLAND: Bay Ridge, VIII, 20, 1 juv. ♂, [U. S. N. M.]. Piney Point, IX, 14, 1902, (Pergande), 1 ♀, recorded by Rehn and Hebard in 1912 as *squamosum*, [U. S. N. M.].

GEORGIA: Perry, Houston County, IX, 10, 1924, (T. H. Hubbell), 1 ♀, [Univ. of Michigan Cln.]. Thomasville, VIII, 3, 1903, (for Hebard), 1 large juv. ♂, recorded by Rehn and Hebard in 1912 as *squamosum*. Bainbridge, IX, 5 and 6, 1915, (Rehn and Hebard; few beaten from oak shoots in oak woods), 3 ♂.

FLORIDA: Hilliard, VIII, 19, 1930, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Waldo, VIII, 18, 1930, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Gainesville, (adults) VII to X, 17, 1923 to 1925, (Hubbell, Walker, Alexander; in leaves and spanish moss on ground in high "hammock," on oak trunk at night, in room attracted to light during night, under street light), 4 ♂, 8 ♀, 12 juv. ♂, 11 juv. ♀, [Univ. of Michigan Cln.]. Ocala, IX, 19, 1917, (Hebard; beaten from bushes in Live Oak "hammock"), 1 ♂. Cedar Keys, IX, 28, 1923 and X, 19, 1924, (F. W. Walker), 2 ♂. [Univ. of Michigan Cln.]. De Leon Springs, IX, 8, 1917, (Rehn and Hebard; beaten from undergrowth of lofty oak "hammock"), 1 ♂. Orlando, VIII, 29, 1924, (F. W. Walker), 2 ♂, [Univ. of Michigan Cln.]. Trilby, Pasco County, IX, 16, 1917, (Hebard; beaten from undergrowth in pine woods), 1 ♂. Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (Rehn and Hebard; very scarce in dense growth of bayberry and other shrubs), 1 ♂. Lakeland, IX, 11, 1917, (Rehn and Hebard; numerous in spanish moss on Live Oaks), 3 ♂, 2 ♀. Cortez Beach, Manatee County, I, 4, 1925, (T. H. Hubbell; sweeping branches of Red Mangrove at night), 1 ♂, 1 ♀, 5 juv. ♂, 2 juv. ♀, [Univ. of Michigan Cln.]. Snead's Island, Manatee County, VIII, 20, 1925, (T. H. Hubbell; in Cabbage Palmetto and oak "hammock"), 1 juv. ♂, 3 juv. ♀, [Univ. of Michigan Cln.]. Fort Myers, IX, 13 and 15, 1917, (Rehn and Hebard; hidden in fronds of Saw Palmetto in pine woods), 3 ♂, 2 ♀, 4 juv. Deerfield, III, 1, 1916, (Hebard), 1 ♀. Boca Raton, III, 1, 1916, (Hebard; from scrub oak in sand area), 1 ♂. Brickell's Hammock, Miami, II, 18 to III, 2, 1916 and 1919, (Hebard; beaten from heavy hammock undergrowth and foliage),[5] 2 ♂, 2 ♀, 3 juv. Western end of Long Island, Biscayne Bay, III, 5, 1922, (Hebard), 2 ♂, 1 ♀, 1 juv. Snapper Creek Hammock, Biscayne Bay, II, 29, 1916, (Hebard; very scarce in "hammock," two from bromeliads growing on Live Oaks on edge of "hammock"), 1 ♂, 1 ♀, 3 juv. Royal Palm Key, III, 3, 1917, (Hebard; from epiphytes in heaviest jungle), 1 very small juv. Woodville, IX, 1, 1915, (Rehn; beaten from oak shoots), 1 ♂. Carrabelle, IX, 2 and 3, 1915, (Rehn and Hebard; beaten from oak shoots in scrub and from bushes in swamp area), 2 ♂, 3 ♀. Chaires, Leon County, VIII, 4, 1925, (T. H. Hubbell; beaten from foliage of Sweet Gum), 1 juv. ♀, [Univ. of Michigan Cln.]. Chattahoochee, VII, 28, 1925, (T. H. Hubbell; beating in flood plain forest,) 1 juv. ♂, 1 juv. ♀, [Univ. of Michigan Cln.]; IX, 1, 1915, (Hebard; on bare sandy border of river in

[5] See comments by Hebard, Ent. News, XXVI, p. 461, (1915).

open), 1 ♀. Camp Torreya, Liberty County, VII, 25 and 28, 1925, (T. H. Hubbell; on sandy, oak dotted, hillside), 2 juv. ♀.

ALABAMA: Dothan, IX, 6 and 7, 1915, (Rehn and Hebard), 1 ♂, 1 ♀. Montgomery, IX, 8, 1915, (Rehn and Hebard; in tangle of raspberry and other vines), 5 ♀. Selma, IX, 9, 1915, (Rehn and Hebard; occasional on Sweet Gum shoots and vines in woods), 4 ♂, 5 ♀. Greenville, VIII, 3, 1915, (Hebard; immatures abundant and widely distributed on ground through forest), 9 juv. Evergreen, VIII, 4, 1915, (Hebard; immatures moderately common in dead leaves and pine needles on ground in forest), 1 juv. ♀. Flomaton, VIII, 27, 1915, (Rehn; beaten from oak shoots in oak woods on sandy hillside), 1 juv. ♀.

MISSISSIPPI: Strickton, Rankin County, IX, 12, 1915, (Hebard; rare in undergrowth of mixed forest on higher ground), 1 ♂, 1 ♀. Brookhaven, IX, 15, 1915, (Rehn; beaten from brush in woods), 1 ♂, 1 ♀. Natchez, IX, 13 and 14, 1915, (Rehn; beaten from oak), 1 ♀.

LOUISIANA: Arcadia, VIII, 20, 1915, (Rehn and Hebard; in low bushes and under bark of dead bush on edge of forest), 5 juv. West Monroe, VIII, 21, 1915, (Rehn and Hebard; occasional in heavy bushes in forest on river bank), 2 ♂, 1 large juv. ♂. Alexandria, VIII, 22, 1915, (Rehn and Hebard; few in low bushes of "branch" forest of Sweet Bay, oaks etc.), 2 ♀, 2 large juv. ♀.

TEXAS: Doucette, VII, 24, 1912, (Hebard; very scarce in low bushes, particularly Sweet Gum shoots, in forest of deciduous trees and pines), 4 juv.

Cycloptilum zebra (Rehn and Hebard) (Pl. XXIII, figs. 1 to 3.)

1905. *Liphoplus zebra* Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 49, pl. 1, fig. 12. [♂; Miami, Florida.]

This species was fully diagnosed and figured and new records of Long Key and Key West were given by Rehn and Hebard in 1912. A series was reported from Ocean Beach near Miami by Davis and from Key West, Florida, by Rehn and Hebard in 1914 and from Brickells Hammock near Miami by Hebard in 1915.

It is the smallest and most delicate of the species here treated, agreeing with *bidens* in the striking marking of the male tegmina, but with *squamosum* in the simple female subgenital plate. Males are distinguished from this sex of both those species by the usually distinctly less ample pronotum.

The species is known from Lake Worth[6] to Key West, Florida. It is rarely encountered but Davis has reported finding a great many under and in the folds of an old pair of trousers lying on the up-beach. As a result it would apparently best be searched for under litter in such environment.

[6] This material, secured by Mrs. Annie T. Slosson on sand, was recorded by her as *Cycloptilus squamosus* in Ent. News, XII, p. 11, (1901). The record was referred to *zebra* by Rehn and Hebard in 1912, after examination of the male upon which it was based.

Cycloptilum squamosum Scudder (Pl. XXIII, figs. 4 to 6.)

1868. *Cycloptilum squamosum* Scudder, Proc. Boston Soc. Nat. Hist., XII, p. 142. [♂; [north-central] Texas.]

In 1912 we correctly diagnosed and figured this species and placed *C. borealis* Bruner as a synonym, but included seven references and numerous records actually representative of other species. In our remarks there we described the female subgenital plate as found in Eastern material (*bidens*) but considered that difference a matter of individual variation, due to the fact that in that series were included several females (now known to represent other species) which did not show it. Much larger series and a better understanding of the regions in which the species of the Squamosum Group occur, enables us now to see clearly that in the United States it is represented by five species and two more geographic races.

Distinguished by the general pallid coloration and simple female subgenital plate, this species is apparently subject to more individual variation than any of the others. Usually averaging slightly larger and more robust than *bidens*, specimens from Galveston, Virginia Point (males but not females), Katherine and Lyford (males but not females) are exceptionally small. Two males of the Virginia Point series, all from Katherine and to a less degree the males from Galveston and Lyford are also exceptionally pallid.

The measurements of the smallest pair, from Katherine, are given below. We also give the measurements of a Columbus male in which the pronotum is unusually elongate and the tegmina less exposed in consequence (this normally about .9 mm. in *squamosum*).

	Length of body	Length of pronotum	Caudal width of pronotum	Length of caudal femur	Width of caudal femur	Exposed length of tegmen
♂						
Texas. *Type*	6.3	3.4	2.9	3.5	1.5	—
Columbus, Texas	6.3	3.9	2.9	3.9	1.42	.43
Katherine, Texas	5	3.2	2.4	3.3	1.27	.53
♀						Length of ovipositor
Dallas, Texas. *Allotype*	7.2	2.2	2.1	4.2	1.8	3.6
Katherine, Texas	5.8	1.56	1.58	3.5	1.25	3.3

Though average differences are found in series of different species, it is evident that size is of very little value in distinguishing these.

Though the male tegmina normally have their caudal margins almost immaculate in the present insect, brown suffusions, similar to but not as heavy as those found in *zebra* and *bidens*, are present in most of the Brownsville specimens. This is probably a response to a darker environment, but it is evident that this feature of coloration is not of as much value in distinguishing these species as would be supposed from examination of the balance of the series.

In our 1912 report only the nineteen specimens from eastern Texas and the sixteen from Lincoln, Nebraska, actually represent *squamosum*. Upon the Nebraskan series Bruner's synonym *borealis* was based, and since that time the species has not been found in Nebraska, Kansas or Oklahoma. There is evidently a question as to whether Bruner's material was correctly labelled, but we do know that *comprehendens comprehendens* occurs as far north as Sidney, Nebraska, so that *squamosum* may simply have been generally missed by collectors in the States mentioned. This is possible due to the very small size of the insect coupled with the fact that it is nocturnal, hiding in the recesses of foliage, under bark or beneath litter on the ground during the day and at night when the males are stridulating they are extremely difficult to locate.

One of the most interesting of distributional discoveries is the finding of this species in the salt marshes at Cedar Keys, Florida. It has evidently been able to extend its distribution so far East along the border of the Gulf of Mexico through adaptation to that type of immediate environment. We found it moderately common in the salt marshes at Virginia Point and Sabine, Texas, but exhaustive search was required to secure the series at Cedar Keys, Florida. Hubbell had recognized the insect as distinct from *bidens* and his field notes give "silver brown gray, no trace of bands etc., when fresh."

Specimens Examined: 85; 29 males, 32 females and 24 immature individuals.

FLORIDA: Cedar Keys, VII, 12, 1925 and X, 18, 1924, (Hubbell and Walker; beaten from salt marsh grass about one foot tall) 2 ♂, 6 ♀, 1 large juv. ♂, [Univ. of Mich. Cln.].

LOUISIANA: Alexandria, VIII, 22, 1915, (Rehn and Hebard; in oak leaves in mixed forest), 1 ♂, 1 ♀. Shreveport, VIII, 19, 1915, (Rehn and Hebard; in forest undergrowth), 1 large juv. ♀.[7]

TEXAS: Bowie County, VIII, 20, 1928, (R. H. Beamer), 1 ♂, [Hebard Cln.]. Sabine, VIII, 11, 1915, (Rehn and Hebard; very common in marsh grass on tidal flats, secured, as is usual, only by beating), 3 ♂, 5 ♀, 1 large juv. ♀. Longview, VIII, 18, 1915, (Rehn and Hebard; moderate numbers in undergrowth of heavy deciduous forest), 1 juv. ♂. Palestine, VIII, 16, 1915, (Hebard; scarce in woodland undergrowth), 1 juv. ♂, 1 juv. ♀. Elkhart, VIII, 16, 1915, (Hebard), 1 ♂. Navasota, VIII, 14, 1915, (Hebard; in scant grasses under oaks of bottom land), 1 juv. ♀. Houston, VIII, 12, 1915, (Rehn and Hebard; adults in spanish moss on oaks, immatures in undergrowth also), 1 ♂, 2 ♀, 3 juvs. Virginia Point, VII, 21, 1912 and VIII, 12, 1915, (Rehn and Hebard; in marsh grass on tidal flats), 3 ♂, 3 ♀, 1 large juv. ♂. Galveston, VI, 1900, 1 ♂, [Hebard Cln.]. Brazoria County, VIII, 9, 1928, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Hearne, VIII, 14 and 15, 1915, (Hebard), 1 juv. ♂. Dallas, VIII, 14 to 16, 1915, (Rehn; by beating on prairie and brush land), 1 ♀, 2 juv. ♂, 1 large juv. ♀. Temple, IX, 24, 1912, (Rehn and Hebard; on edge of tree bordered stream), 1 ♀. Shovel Mount in Burnet County, IX, 5, 1901, (F. G. Schaupp), 1 ♂, [A. N. S. P.]. Austin, X, 12, 1901, (A. L. Melander), 1 ♀, [Hebard Cln.]. Victoria, VI, (A. N. Caudell), 1 ♀, [U. S. N. M.]. Brooks County, VII, 25, 1928, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Sarita, XII, 1, 1911, (C. A. Hart; on sandy prairie), 1 ♀, [Hebard Cln.]. Aransas County, VIII, 6, 1928, (R. H. Beamer), 1 ♀, [Hebard Cln.]. Katherine, XII, 3, 1911, (C. A. Hart; on sand and under dead weeds on sand), 2 ♂, 3 ♀ (very small), [Illinois State and Hebard Clns.]. Lyford, VIII, 7, 1912, (Rehn and Hebard; beaten from weeds in field), 3 ♂ (very small), 1 ♀ (normal size), 1 juv. ♂, 1 juv. ♀. Brownsville, VII, 31, 1912 and VIII, 3, 1921, (Rehn and Hebard; beaten from high weeds in river bottom), 1 ♂, 1 ♀, [Hebard and Ill. State Clns.]. Piper Plantation near Brownsville, XII, 19, 1910, (C. A. Hart), 1 ♀ (unusually small),[8] [Hebard Cln.]. Mission, Hidalgo County, VIII, 5 and 6, 1912, (Rehn and Hebard), 1 juv. ♀. Hidalgo County, VII, 28 and 30, 1928 and 1929, (R. H. Beamer), 5 ♂, 1 ♀, 2 juv. ♂, 1 juv. ♀, [Univ. of Kansas]. Kerrville, VIII, 17, 1912, (Rehn and Hebard; on ground among plants and grasses and under bushes on hillside), 2 ♂, 1 ♀, 1 large juv. ♂, 1 juv. ♀. San Antonio, VIII, 15, 1912, (Rehn; only one seen, under dead eaves under oaks), 1 large juv. ♀. Starr County, VII, 30, 1928, (L. D. Beamer), 1 ♀, [Hebard Cln.].

The species is known to occur on the Gulf Coast from Sabine to Brownsville, Texas, northern limits being Alexandria, Louisiana, and Longview and Dallas, Texas,[9] its western limits reaching

[7] We believe we can distinguish this specimen from *bidens* in the same instar by the more robust build and more prominent interantennal protuberance.

[8] In this specimen the latero-caudal portions of the subgenital plate are less roundly produced than is usual in *squamosum*.

[9] We omit the Nebraska record for the reasons given above.

Shovel Mount, Kerrville, San Antonio and Mission in the latter State.

Cycloptilum bidens new species (Pl. XXIII, figs. 7 to 11.)

This is the eastern insect which invariably in the past has been recorded as *squamosum*. In 1912 Rehn and Hebard described the differences in the female subgenital plate, but due to confusion in the material (five species or races were there included) it was incorrectly supposed that such was attributable to individual variation. Though some variation does occur in the size and form of the minute angles which project disto-laterad as well as in the normally emarginate area between them, all females here recorded show such differentiation distinctly and are thereby easily separated from all other known species of the genus.

The striking tegminal markings readily distinguish the male sex from the other species found in the United States except the differently proportioned *zebra*, known only from southern Florida.

Type.—♀; St. Simon's Island, Georgia. August 30, 1911. (Rehn and Hebard.) [Hebard Collection, Type No. 1175.]

Size and form much as in *squamosum* (but series often averaging slightly smaller and a little more graceful). Fastigium similar but proportionately smaller; less prominent and more transverse. Palpi with fifth joint slightly longer than third and evenly moderately expanding distad as in all the species of this Group. Pronotum simple, tubular, lateral margins weakly convex, caudal width almost equal to length. Ovipositor much as in *squamosum*, straight (in series often slightly decurved, rarely very slightly recurved), its apex lanceolate. Subgenital plate scoop-shaped, lateral margins broadly convex-convergent, terminating on each side of the apical portion in a minute sharp tooth, the apical portion shallowly emarginate, concave on each side but convex mesad.[10] Limbs, their armament and auditory foramen on cephalic face of cephalic tibiae as in *squamosum*.

Allotype.—♂; same data as type. [Hebard Collection.]

Apparently indistinguishable from males of *squamosum* except in size and form as noted for the opposite sex. Similar but proportionately smaller, less prominent and more transverse

[10] The margins of the subgenital plate individually vary in outline. Often the lateral margins are quite strongly convex, this making the diameter of the distal emargination narrower, while that portion is then usually wholly concave. In other specimens the distal emargination has its median convexity much more decided than usual. No geographic correlation appears to exist.

fastigium (a feature showing only slight degree of difference). Tegmina with distal portions exposed, the margins there very strikingly marked with blackish brown as here figured. Genitalia apparently as in *squamosum*.

General coloration light reddish brown, deepening distad on abdomen. Head and pronotum immaculate; a single male from River Junction, Florida, showing darker suffusions latero-cephalad on the latter. Such pronotal marking is very rarely found in *squamosum*, but is usually very conspicuous in *distinctum* and in the races of *comprehendens*. Tegmina of male clay color, marked as here figured.

As Rehn and Hebard stated in 1912 "Individuals from the Atlantic Coast [*bidens*] are similar to western specimens [*squamosum*] in body coloration, but their scale covering is usually composed chiefly of blackish or slate-colored scales which gives the specimens a dark and somewhat mottled appearance [thus differing] from that of western representatives [*squamosum*]."

In 1912[11] we gave numerous measurements under *squamosum*. Of these the Nebraska and Texas specimens represent that species, but those from North Carolina and Georgia are referable to *bidens*. It is evident that measurements are of little value in distinguishing these species.

The measurements of the allotype and type of *bidens* are as follows; length of body ♂ 5.4, ♀ 6; length of pronotum ♂ 3.2, ♀ 1.7; caudal width of pronotal disk ♂ 2.6, ♀ 1.77; length of caudal femur ♂ 3.8, ♀ 3.9; width of caudal femur ♂ 1.52, ♀ 1.49; exposed length of tegmen ♂ .85; length of ovipositor 3.1 mm.

Size variation in the series before us is not very great, still the smallest specimens (one female Pomona, Florida and one male Indian Beach, Florida and a number of the more western individuals) are no larger than the largest specimens of *zebra*, though all such males have the pronotum considerably longer.

Specimens Examined: 122; 53 males, 53 females and 16 immature individuals.

NEW YORK: East Marion, Long Island, VIII, 2, 1913, (W. T. Davis; under log on sand on up-beach), 1 juv. ♂, (reported by Davis as *squamosum* in 1914), [Davis Cln.].

NEW JERSEY: Lakehurst, X, 3, 1909, (Davis and Sleight; in pine woods undergrowth), 1 ♂, 1 ♀, (reported by Davis as *squamosum* in 1909), [Davis Cln.].

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[11] Proc. Acad. Nat. Sci. Philadelphia, 1912, p. 211.

NORTH CAROLINA: (Reported by Rehn and Hebard as *squamosum*) from Raleigh, Wilmington, Winter Park, Wrightsville (in 1912) and Goldsboro (in 1916). Southern Pines, VIII, 28, 1928, (T. H. Hubbell), 1 ♀, [Univ. of Michigan Cln.].

SOUTH CAROLINA: (Reported by Rehn and Hebard as *squamosum*) from Spartanburg, Columbia (in 1916) and Yemassee (in 1912).

GEORGIA: (Reported by Rehn and Hebard as *squamosum*) from Thompson's Mills, Isle of Hope, St. Simons Island,[12] Cumberland Island, Brunswick (in 1912), Toccoa, Jasper, near Stone Mountain, Macon, Warm Springs and Albany (in 1916). Bainbridge, IX, 5, 1915, (Rehn and Hebard; few on ground in Long-leaf Pine forest undergrowth), 1 ♂, 3 ♀.

FLORIDA: (Reported by Rehn and Hebard as *squamosum*) from Atlantic Beach, San Pablo, Gainesville, Live Oak (in 1912) and Lakeland (in 1914). Pablo Beach, VIII, 13, 1905, (Rehn and Hebard), 1 juv. ♂. Pomona, IX, 7, 1917, (Rehn and Hebard; sweeping near edge of lake), 1 ♀. Gainesville, V, 14 and 15, 1925, (T. H. Hubbell; on branches of Turkey Oak, *Quercus catesbaei*, with *Atlanticus dorsalis*), 2 ♂, 1 ♀,[13] [Univ. of Michigan Cln.]. Orlando, adults V, 10 to IX, 21, 1924, juvs. all IX, (Hubbell, in sandy scrub area; Walker; Alexander), 3 ♂, 6 ♀, 2 juv. ♂, 1 juv. ♀, [Univ. of Michigan Cln.]. Trilby, IX, 16, 1917, (Hebard; undergrowth in sandy scrub area), 1 juv. ♂. Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (Hebard; very scarce in dense brush characteristic of the Florida coast), 1 ♂. Tampa, I, 5, 1925, (T. H. Hubbell; in Turkey Oak woods), 2 ♂, [Univ. of Michigan Cln.]. Cortez Beach, Manatee County, I, 4, 1925, (T. H. Hubbell; in tidal debris on upper levels of beach), 2 juv. ♂. Tallahassee, IX, 2, 1915, (Hebard; very few in upland forest of Water Oaks), 1 ♀,[14] 1 juv. ♀. Carrabelle, IX, 2, 1915, (Rehn and Hebard; on ground in sandy scrub), 1 ♀. River Junction, VIII, 31, 1915, (Rehn and Hebard), 7 ♂, 3 ♀, 3 juv. ♀. Camp Torreya, Liberty County, VII, 30, 1925, (T. H. Hubbell; on tall shrub along margin of *Torreya* ravine), 1 juv. ♀, [Univ. of Michigan Cln.]. Fort Barrancas, VIII, 28, 1915, (Hebard; in dead leaves under Water Oaks), 1 ♀.

ALABAMA: Dothan, IX, 6 and 7, 1915, (Rehn and Hebard), 1 ♀. Evergreen, VIII, 4, 1915, (Hebard; in dead leaves and pine needles of mixed forest), 1 ♂, 1 juv. ♂, 1 juv. ♀. Selma, IX, 9, 1915, (Rehn and Hebard; few in dead pine needles in Short-leaf Pine woods), 1 ♂, 1 ♀. Springhill, Mobile County, VIII, 25, 1915, (Hebard; in great numbers on ground through pine forest), 1 ♂, 2 ♀.[15]

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[12] In addition to the type and allotype, thirty-two males and twenty-five females bearing the same data and now before us are designated paratypes. These belong to the Davis Cln., U. S. N. M., Univ. of Kansas, Cornell Univ., Univ. of Michigan, California Acad. of Sci. and the Philadelphia Collections.

[13] "Stridulating a series of rapid, tinkling musical notes at the rate of one hundred and ten per minute. The note is high pitched but not penetrating, distinct and clear at ten feet but hardly distinguishable at thirty. Many were heard in a small group of trees but none elsewhere."

[14] Lateral projections of subgenital plate extremely small, emargination scarcely indicated.

[15] Lateral projections of subgenital plate extremely small, emargination weak.

MISSISSIPPI: Meridian, IX, 10, 1915, (Rehn and Hebard; moderate numbers in dead pine needles and oaked leaves in mixed valley forest), 2 ♀. Strickton, Rankin County, IX, 12, 1915, (Hebard; common, undergrowth of mixed forest on higher land), 1 ♂. Brookhaven, IX, 15, 1915, (Rehn; beaten from forest undergrowth), 1 ♀.

LOUISIANA: Alexandria, VIII, 22, 1915, (Rehn and Hebard; among dead oak leaves in mixed forest), 2 ♀, 1 large juv. ♀.

Cycloptilum distinctum new species .(Pl. XXIV, figs. 1 to 3.)

This diminutive species is clearly a member of the Squamosum Group, but differs widely from the other known species in the production of the male pronotum, which is exceeded in the described American species only in the Colombian *C. thoracicum* Hebard.

The female subgenital plate is simple, as in *squamosum,* but is more produced and much more strongly rounded distad than in that species.

The pronotal markings are very prominent in the present insect.

Type.—♂; Tia Juana, San Diego County, California. September 11, 1922. (Rehn and Hebard.) [Hebard Collection, Type No. 1172.]

Size as in *C. squamosum* Scudder, form appearing broader, due to the greater amplitude of pronotum and tegmina caudad. Fastigium similar but, as in *C. comprehendens* Hebard, slightly less strongly transverse in dorsal aspect; medio-longitudinal and proximal transverse sulcus distinct. Palpi with third and fifth joints moderately elongate, the latter faintly the longer and moderately and evenly expanding distad; fourth joint slightly shorter than third. Eyes as in *squamosum.* Pronotum decidedly more produced and widened caudad, its caudal margin curving to form less than a semicircle (see Pl. XXIV, fig. 1). Tegmina dorsad exposed in broad distal marginal portion (this broader than in *comprehendens*) and laterad in extensive distal portion of lateral fields. Genitalia much as in *squamosum.* Limbs, their armament and auditory foramen of cephalic face of cephalic tibiae as in *squamosum.*

Allotype.—♀; same data as type. [Hebard Collection.]

Size and form much as in this sex of *squamosum.* Pronotum similar, simple, tubular, the lateral margins weakly convex and weakly convergent cephalad; caudal width, however, slightly greater than length. Tegmina and wings absent. Ovipositor

as in *squamosum*, but with apex apparently slightly narrower;[16] shaft showing a very faint curvature ventrad. Subgenital plate truncate-triangular, scoop-shaped, embracing base of ovipositor; lateral margins very broadly convex-declivent to the narrow transverse apex beneath the ovipositor shaft.

Head buffy, with almost all of the occiput and interocular area suffused blackish brown, the small paler areas there reddish brown. Pronotum pale reddish brown, in male deepening caudad to warm sepia but paler, clay color, along the caudal margin; in both sexes with an oval blackish brown marking on each side of disk near cephalic margin, and in female and immature with weak dark suffusion between, cephalad and latero-caudad. Tegmina of male clay color with marginal portion of dorsal field mottled with warm sepia (this marking not striking as it is in the eastern species). Abdomen blackish dorsad; ventral surface of male and subgenital plate of female paler. Cephalic and median limbs buffy. Caudal femora suffused externally with warm sepia particularly distad but with a pale pre-genicular area; generally paler and more streaked in the female. Tibiae irregularly but distinctly annulate, this only partially due to light and dark scales.

The described pair measure: length of body ♂ 7, ♀ 6.2; length of pronotum ♂ 4.4, ♀ 1.7; caudal width of pronotal disk ♂ 2.8, ♀ 2.11; length of caudal femur ♂ 4.5, ♀ 4.8; width of caudal femur ♂ 1.5, ♀ 1.56, exposed length of tegmen ♂ .92; length of ovipositor 3.7 mm.

Specimens Examined: 3; 1 male, 1 female and 1 immature individual.

CALIFORNIA: San Diego, VIII, 10, 1916, (E. P. VanDuzee), 1 large juv. ♂, [Cal. Acad. Sci.]. Tia Juana, IX, 11, 1922, (Rehn and Hebard; beaten from chaparral in which *Adenostoma fasciculatum* was predominant on hillside where *Horesidotes cinereus saltator* and a species of *Brachyinsara* were also found), 1 ♂, 1 ♀, type, allotype.

Cycloptilum comprehendens interior new subspecies (Pl. XXIV, fig. 4.)

In the present species decided individual variation in degree of production of the male tegmina is found; see Pl. XXIV, figs. 5 and 8.

This race is distinguished from the more southern *comprehendens fortior*, with which we believe it will be found to intergrade in extreme sourthern Nevada and along the northern border of the Mojave Desert in California, in the lateral projections of the

[16] This is possibly due to distortion in this unique female.

female subgenital plate, which are much smaller, triangular, with apices sharply rounded.

Type.—♀; Leeds, Washington County, Utah. 3200 feet. September 5, 1926. (M. Hebard.) [Hebard Collection, Type No. 1174.].

Generally as here described for *comprehendens fortior*, except the subgenital plate which is scoop-shaped, embracing base of ovipositor, with latero-caudal portions briefly triangularly produced, but reaching to upper portion of ovipositor shaft and broader than long.

Allotype.—♂; same data as type. [Hebard Cln.].

This sex is possibly indistinguishable from males of the other races of the species. The males before us, however, have a distinctly shorter pronotum.

Coloration as here described for *comprehendens fortior*. In the few adults before us the occiput is little darkened, but the pronotal disk has the latero-cephalic darker markings heavy and extensive though suffused. These latter markings are much weaker but present in the two immature individuals here recorded.

Measurements (in millimeters)

	Length of body	Length of pronotum	Caudal width of pronotum	Length of caudal femur	Width of caudal femur	Exposed length of tegmen
♂						
Leeds, Utah. *Allotype*	6.4	3.2	2.9	4.3	1.5	1.63
Grapevine Mts., Cal.	6.7	3.1	2.8	3.8	1.42	1.45
♀						Length of ovipositor
Leeds, Utah. *Type*	7.9	1.98	2.3	4.5	1.58	3.6
Washington, Utah. *Paratype*	8	1.91	2.2	4.8	1.7	4.7
Grapevine Mts., Cal.	7	1.88	2.24	4.5	1.63	3.5

We believe that it was this race which we heard on all sides in the desert brush while camping the night of September 5, 1924 on Millers Flat at the west base of Lone Peak, Esmeralda County, Nevada, at 4270 feet elevation. We later noted the similarity of the song of *comprehendens fortior* near Snyders Hill, Arizona

(here given in footnote 17) and said that there it was likewise easily the most noticeable and general insect stridulation to be heard after dark.

Though probably generally distributed and moderately abundant through the desert valleys of extreme southwestern Utah, southern Nevada and the adjacent eastern section of California, we found this insect extremely difficult to secure. Even at Millers where, from the singing it was evidently abundant, none could be captured, though in Texas and Arizona, particularly on the Creosote Bush, large series of *comprehendens fortior* could sometimes be assembled by beating.

We believe that the northern limits of the species as well as the race are little north of the localities given below. Southward the area of intergradation with *comprehendens fortior* is unknown. Unfortunately no females have been secured on the Mojave Desert. It is very interesting to note that whereas females from Prescott, Arizona, are typical of *comprehendens fortior*, the single female from the Hualapai Mountains in that State, though strongly atypical, shows stronger divergence toward typical *comprehendens* than toward the present race. Much collecting remains to be done in Oklahoma, New Mexico, northern Arizona, southern Nevada and southeastern California before the distribution of the three races of *comprehendens* can be at all accurately outlined.

Specimens Examined: 7; 2 males, 3 females and 2 immature individuals.

UTAH: Leeds, Washington County, 3200 feet, IX, 5, 1926, (Hebard; numerous, stridulating at dusk and for a short time after dark in desert bushes, one taken stridulating near ground on stem of Creosote Bush), 1 ♂, 1 ♀, *type, allotype.* Washington, 3000 feet, IX, 6, 1916, (Hebard; beaten from desert brush), 1 ♀, *paratype.*

CALIFORNIA: Daylight Spring, Grapevine Range, 4350 feet, VIII, 13, 1919, (Rehn and Hebard; beating Creosote Bush and other desert bushes), 1 ♂, 1 ♀, *paratypes*, 2 juv. ♂.

Cycloptilum comprehendens fortior[17] new subspecies (Pl. XXIV, figs. 5 to 7.)

This race is mainly distinguished from typical *comprehendens* by the lateral projections of the subgenital plate, which are very much broader, gradually tapering to their broadly rounded

[17] In allusion to the heavier projections of the female subgenital plate.

extremities. The length and form of these projections is subject to some individual variation, but in none of the material here listed are they nearly as slender as in typical *comprehendens* nor as small or as nearly triangular as in *comprehendens interior*.

Type.— ♀ ; Ajo, Pima County, Arizona. 1500 feet, September 18, 1922. (Rehn and Hebard.) [Hebard Collection, Type No. 1173.]

Generally much as in typical *comprehendens*, excepting the subgenital plate. Size (average) larger and form (average) slightly more robust than in *squamosum*. Fastigium similar but slightly less strongly transverse in dorsal aspect. Palpi with third and fifth joints moderately elongate, the latter very slightly the longer, fourth joint slightly shorter. Pronotum simple, tubular, caudal width almost equal to length. Ovipositor much as in *squamosum*, straight (often slightly decurved, rarely slightly recurved), (averaging shorter than in typical *comprehendens*). Subgenital plate scoop-shaped, embracing base of ovipositor, latero-caudal portions broadly triangularly produced, decidedly longer than wide beyond base, with apices broadly rounded and reaching upper portion of ovipositor shaft, the basal width of one of these approximating its length. Limbs and their armament and foramen of cephalic face of cephalic tibiae as in *squamosum*.

Allotype.—♂; six miles North of Ajo, Pima County, Arizona. 1600 feet. September 16, 1922. (Rehn and Hebard.) [Hebard Cln.].

Very similar to this sex of typical *comprehendens*. Tegmina much more extensively exposed than in allotype of that race, but series show them to vary in that insect to fully as much exposed as in *comprehendens fortior*. Genitalia similar.

Males and immature individuals of these races show no features by which we can separate them.

Head pale reddish brown paling ventrad, occiput often suffused or with several suffused darker longitudinal markings. Antennae not at all or very faintly annulate. Pronotum pale reddish brown, with a darker suffusion on each side of disk near the cephalic margin, this marking often striking, blackish brown. Tegmina clay color, with distal margin sometimes very faintly tinged with brownish. Abdomen dorsad blackish, becoming reddish brown at base in females.

Measurements (in millimeters)

	Length of body	Length of pronotum	Caudal width of pronotum	Length of caudal femur	Width of caudal femur	Exposed length of tegmen
♂						
Chinati Mts., Texas	7–8	3.8–4	2.8–3.1	4.4–4.9	1.6–1.7	1.34–1.45
Coyote Mts., Ariz	6.8	4	3.2	5	1.9	1.27
Batamote Well, Ariz. *Paratype*	7	3.8	2.7	3.8	1.49	.99
Near Ajo, Ariz. *Allotype.*	6.7	3.6	2.8	4.2	1.5	1.63
Cottonwood, Cal	7.2	3.7	2.8	4.7	1.63	1.45
♀						Length of ovipositor
Chinati Mts., Texas	7.8–8	2.08–2.13	2.34–2.27	4.9–5.1	1.84–1.86	4.7–4.9
Tumamoc Hill, Ariz	8.2	2.2	2.48	5.2	1.9	4.7
Ajo, Ariz. *Type*	7.4	2.2	2.58	5	1.91	4
Prescott, Ariz	7.4	1.84	2.15	4.3	1.5	3.8

The series from the Big Bend region in Texas and from southern Arizona average distinctly larger than the others.

We are unable to assign racially a male and immature specimens of this species from Uvalde, Del Rio, Langtry, and the Davis Mountains in Texas. As noted under *comprehendens interior*, no females of the species have been secured in the Mojave Desert and there is therefore some uncertainty as to whether the Californian material here recorded is typical or atypical of *comprehendens fortior*, though the longer pronotum of males strongly suggests that *comprehendens interior* does not occur so far South.

Specimens Examined: 137; 55 males, 47 females and 35 immature individuals.

Texas: Carrizo Springs, X, 1884, (A. Wadgymar), 1 ♀, (previously reported by Rehn and Hebard as *squamosum*), [Hebard Cln.]. Sanderson, VIII, 25, 1912, (Rehn and Hebard; fairly common in Black Brush, *Flourensia cernua*, moderate numbers on Creosote Bush, *Covillea tridentata*, and in dry water course, occasional on hillside up to 2950 feet), 14 ♂, 2 ♀ (projections of subgenital plate slightly narrower than normal), 4 large juv. ♂, 4 large juv. ♀. Two miles North of Bone Spring, Brewster County, IX, 9, 1912, (Rehn and Hebard), 1 ♂, 1 ♀ (projections of subgenital plate normal), 1 large juv. ♀. Persimmon Gap, Brewster County, IX, 10, 1912, (Rehn and Hebard; on desert hills), 4 ♂, 3 ♀ (projections of subgenital plate normal in two females, distinctly narrower in one female). Moss Well, Chisos Mountains, 4500 to 5000

feet, IX, 5 to 8, 1912, (Rehn and Hebard), 1 ♂, 4 ♀ (projections of subgenital plate normal in three females, much more acute in one female). Canyon behind Pulliam Bluff, Chisos Mts., 4600 to 5000 feet, IX, 7, 1912, (Rehn and Hebard), 19 ♂, 12 ♀ (projections of subgenital plate very blunt in one female, normal in seven females, more acute in one female, much more acute in one female, similar but shorter in two females). Hills West of Ord Mountains, Brewster County, VIII, 22 to 31, 1926, (O. C. Poling), 1 ♂, 1 ♀ (projections of subgenital plate of female normal), [Hebard Cln.]. Midway, Chinati Mountains, IX, 30, 1928, (E. R. Tinkham; on Creosote Bush), 3 ♂, 3 ♀ (projections of female subgenital plate normal in two, shorter but more acute in one), [Tinkham and Hebard Clns.].

ARIZONA: Mescal, VII, 28, 1927, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Santa Rita Mountains, 4500 feet, IX, 9, 1925, (A. A. Nichol), 2 ♂, 1 ♀ (projections of female subgenital plate normal), [Univ. of Kansas]. Tucson, VIII, 14 to 17, 1916, (Rehn and Lutz,) 1 ♂, 1 ♀ (projections of female subgenital plate narrower than normal), 2 large juv. ♀, [Acad. Nat. Sci. Phila. and Amer. Mus. Nat. Hist.]. Tumamoc Hill, Tucson Mountains, 2400 to 3000 feet, X, 4, 1910, (Rehn and Hebard; beaten from Creosote Bush), 2 ♀ (projections of subgenital plate normal), (recorded by Rehn and Hebard previously as *squamosum*). Snyders Hill, Pima County,[18] 2500 feet, X, 11, 1910, (Rehn and Hebard), 1 ♀ (projections of subgenital plate more acute), (reported previously as *squamosum* by Rehn and Hebard). San Xavier, VII, 25 and 26, 1916, (Rehn and Lutz), 1 juv. ♂, [Amer. Mus. Nat. Hist.]. Black Dike Prospect, Sierrita Mountains, VII, 26 to 28, 1916, (Rehn and Lutz), 1 juv. ♂, 2 juv. ♀, [Acad. Nat. Sci. Phila. and Amer. Mus. Nat. Hist.]. Bear Valley, Pajaritos Mountains, IX, 22, 1922, (Rehn; beating), 1 ♀ (projections of subgenital plate unusually narrow, almost intermediate between this race and typical *comprehendens*). Coyote Mountains, VIII, 4 to 7, 1916, (Rehn and Lutz), 1 ♀ (projections of subgenital plate normal), 2 juv. ♂, 7 juv. ♀, [Acad. Nat. Sci. Phila. and Amer. Mus. Nat. Hist.]. Roadside Mine, Coyote Mountains, 2800 feet, IX, 14, 1924, (Rehn and Hebard), 1 ♀ (projections of subgenital plate normal). Kits Peak Rincon, Baboquivari Mountains, (Rehn and Lutz), 3 juv. ♂, 2 juv. ♀, [Acad. Nat. Sci. Phila. and Amer. Mus. Nat. Hist.]. Kvitak, East of Quijotoa Mountains, 1530 feet, IX, 15, 1924, (Rehn and Hebard; taken at light at night, heard numerous in desert brush), 1 ♂, 1 ♀ (projections of female subgenital plate normal). Quijotoa, VIII, 26, 1927, (J. C. Bradley), 1 juv. ♀, [Cornell Univ.]. Quitobaquita Hills, IX, 19, 1922, (Rehn and Hebard), 2 ♀ (projections of subgenital plate normal in one, slightly longer in the other). Fortification Rock, Baboquivari Valley, 2900 to 3300 feet, IX, 14, 1924, (Hebard; beaten from dense hillside shrubbery), 1 ♂, 1 ♀ (projections of subgenital plate of female slightly narrower than usual). Batamote Well, Valley of the Ajo, 1500 feet, IX, 16, 1924, (Rehn and Hebard; attracted to camp light at night), 1 ♂, 1 ♀, *paratypes*. Six miles North of

[18] While camping nearby on September 27, 1924, we noted "After dark *Cycloptilum* heard everywhere on arboreal desert. The song is a high-pitched trilling dee-dit-dee-dit-dee-dit- and is often continued over a considerable period. The pitch was noted to vary slightly individually. The sound was easily the most noticeable and general to be heard after dark.

Ajo, 1600 feet, IX, 18, 1922, (Rehn; beaten from Creosote Bush), 1 ♂, *allotype*. Ajo, 1800 feet, IX, 18, 1922, (Rehn and Hebard; beaten from desert hillside shrubbery), 4 ♀, *type* and *paratypes* (subgenital plate normal in all). Kingman, VIII, 2, 1919, (Hebard; beaten from rabbit-weed, *Chrysothamnus* sp.?), 2 juv. ♂, 1 juv. ♀; VIII, 20, 1920, (O. C. Poling), 1 ♂, [Hebard Cln.]. Sawmill Canyon, Hualapai Mountains, VIII, 31, 1920 and IX, 10, 1919, (O. C. Poling), 1 ♂, 1 ♀ (projections of female subgenital plate very narrow, about intermediate between this race and typical *comprehendens*), [Hebard Cln.]. Prescott, VIII, 21 and 24, 1917, (J. A. Kusche), 2 ♀ (projections of subgenital plate normal), 1 juv. ♂, [Hebard Cln.]. Senator, VIII, 12, 1917, (J. A. Kusche), 1 ♂, [Hebard Cln.]. Tinajas Altas, 1905, (W. J. McGee), 1 ♀ (projections of subgenital plate normal), (previously reported by Rehn and Hebard as *squamosum*), [Hebard Cln.].

California: Needles, 650 feet, VIII, 4 and 5, 1919, (Rehn and Hebard), 1 small juv. Goffs, 2584 feet, VIII, 5, 1919, (Rehn and Hebard; from desert brush and dead yucca trunk), 2 small juvs. Newberry, 1831 feet, IX, 9, 1924, (Rehn and Hebard), 1 ♂. Cottonwood, Mojave Desert, 2274 feet, IX, 9, 1907, (Hebard; from Creosote Bush), 1 ♂ (previously reported by Rehn and Hebard as *squamosum*).

Cycloptilum comprehendens comprehendens Hebard (Pl. XXIV, figs. 8 to 10.)

1929. *Cycloptilum comprehendens* Hebard, Proc. Acad. Nat. Sci. Philadelphia, LXXXI, p. 421, pl. 11, figs. 3 to 5. [♂, ♀, juvs.; type locality, Baculite Mesa, Pueblo County, Colorado at 5000 to 6200 feet.]

In distinguishing this handsome species from *squamosum* we stated that it "may be separated by the very strikingly specialized, instead of simple, female subgenital plate." In *squamosum* the pronotum dorsad is normally immaculate, but in the present insect two dark suffusions occur there latero-cephalad.

The possibility of racial relationship with *squamosum* is disproven by the series from Kerrville, Texas, at which place both of these species were found typical.

The species was described from one hundred and eight specimens. Its range is known to extend East to Kerrville, Cotulla and Canadian, Texas, and Hugoton in Stevens County, Kansas. Northern limits are Julesburg, Colorado and Sidney, Nebraska and the Rocky Mountains constitute a barrier westward. In the Southwest we have it typical as far as Farmington, Melena and Carlsbad, New Mexico and Kent, Marathon and Starr County, Texas, but it there intergrades over a considerable area with the western *comprehendens fortior*, that insect being also represented in the Carrizo Springs and Sanderson, Texas series

and intermediates to individually varying degrees being found in the material from the Chisos Mountains and regions immediately to the north, though those series are in very large part closer to *comprehendens fortior*.

These races both average larger and sturdier than *squamosum*.

Only the following material has been received since the original description, based on a series of one hundred and eight specimens.

KANSAS: Hugoton in Stevens County, VIII, 10 and 15, 1911, (F. X. Williams), 2 ♂, 3 juv. ♂, [Univ. of Kansas and Hebard Clns.].

TEXAS: Starr County, VII, 30, 1928, (L. D. Beamer), 1 ♀, [Hebard Cln.].

HOPLOSPHYRUM Rehn and Hebard

1912. *Hoplosphyrum* Rehn and Hebard, Proc. Acad. Nat. Sci. Philadelphia, 1912, p. 222.

Genotype: *H. occidentale* (Scudder), (by original designation).

Chopard has suggested to us that this genus might be the same as *Ornebius* Guérin 1844, with genotype the Mauritian *xanthopterus* Guérin. Without material of that species a definite decision can not be made, but we believe that two distinct genera are represented.

In the present genus the ovipositor is very unusual in not enlarging at all at its apex and the medio-internal spur of the caudal tibiae is very long.

We have before us specimens of the Philippine *Ornebius abdominalis* (Stål) which differ further very strikingly in having the caudal metatarsi of even depth to near the base instead of gradually but distinctly widening to that point, while the male titillators project as two very elongate straight spines, these organs being wholly concealed in *Hoplosphyrum*.

Hoplosphyrum boreale (Scudder)

1902. *Ectatoderus borealis* Scudder, Proc. Davenport Acad. Sci., IX, p. 58, pl. 4, fig. 4. [♂, ♀: La Cueva and Dripping Springs, Organ Mountains, New Mexico; Julian, California.]

The species was recorded from Claremont, California, by C. F. Baker in 1905; from between Alamogordo and Dry Canyon and the Florida Mountains, New Mexico by Rehn and Hebard in 1909, and from Los Angeles, California and numerous localities in Lower California by Rehn and Hebard in 1912.[19]

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[19] See Proc. Acad. Nat. Sci. Phila., 1912, p. 227, fig. 28 and table of measurements.

In the Baboquivari Mountains, Arizona, we made the following notes. "The song is a high-pitched continuous cree-cree-cree-cree-, higher and more rapid than that of *Gryllus*. Individuals stop stridulating when still distant and are very difficult to locate. If once seen, however, they are very easy to catch, making little effort to escape." The species is nocturnal.

Specimens Examined (in addition to the previously reported series): 56; 20 males, 18 females and 18 immature individuals.

TEXAS: Brownsville, VIII, 5, 1912, (Hebard; common immature in nests of pack rats, *Neotoma* sp., made of debris under piled cactus, *Opuntia* sp.), 4 juv. ♂, 3 juv. ♀. Piper Plantation near Brownsville, VIII, 3, 1912, (Rehn and Hebard; moderately numerous in debris under palms in heavy jungle), 9 ♂, 6 ♀, 1 juv. ♂, 2 juv. ♀. Mission, Hidalgo County, VIII, 6, 1912, (Hebard; from nest of pack rats), 1 small juv. ♂. Uvalde, 1000 feet, VIII, 21 and 22, 1912, (Rehn and Hebard; from nests of pack rats), 2 small juv. ♂, 4 small juv. ♀. Moss Well, Chisos Mountains, 5300 feet, IX, 5 to 8, 1912, (Rehn and Hebard), 1 ♂. Kent, IX, 17, 1912, 3900 to 4100 feet, (Rehn and Hebard; few heard in evening, found in dead sotol and under dead yucca), 3 ♀. Maguires Ranch, Upper Limpia Canyon, Davis Mountains, 5000 to 5600 feet, VIII, 29, 1912, (Rehn and Hebard; under loose bark on Alligator-bark Juniper, one female under board nailed to oak at camp), 3 ♂, 3 ♀. Franklin Mountains, 4000 feet, IX, 16, 1912, (Rehn and Hebard; on mesa), 1 ♂, 2 ♀.

ARIZONA: South base of Atascosa Mountain, Santa Cruz County, 5100 feet, IX, 22, 1924, (Rehn; attracted to light in camp), 1 ♀. Upper Madera Canyon, Santa Rita Mountains, 4900 feet, IX, 24, 1924, (Hebard; frequent in dead oak leaves where these were interspersed with fragments of rock), 2 ♂. Schaeffer Canyon, Baboquivari Mountains, 5160 to 5250 feet, IX, 18, 1924, (Hebard; found at night common under fragments of granite at bases of ledges along wash), 2 ♂, 2 ♀.

CALIFORNIA: Indian Joe Spring, Argus Range, 2600 feet, IX, 9, 1922, (Rehn; on bare rock of canyon bed), 1 ♀. Mill Creek Canyon, San Bernardino Range, IX, 23, 1923, (E. P. Van Duzee), 2 ♂, [Cal. Acad. Sci. and Hebard Cln.]. Dulzura, 1500 feet, IX, 12, 1922, (Hebard; under boulder), 1 small juv. ♀.

EXPLANATION OF PLATES

PLATE XXIII

Fig. 1.—*Cycloptilum zebra* (Rehn and Hebard). Dorsal view of male. *Type*. Miami, Florida. (× 6.)

Fig. 2.—*Cycloptilum zebra* (Rehn and Hebard). Ventral view of female subgenital plate. Key West, Florida. (Greatly enlarged.)

Fig. 3.—*Cycloptilum zebra* (Rehn and Hebard). Lateral outline of female subgenital plate. Key West, Florida. (Same scale as fig. 2.)

Fig. 4.—*Cycloptilum squamosum* Scudder. Dorsal view of male. Sabine, Texas. (× 6.).

Fig. 5.—*Cycloptilum squamosum* Scudder. Ventral view of female subgenital plate. Sabine, Texas. (Same scale as fig. 2.)

Fig. 6.—*Cycloptilum squamosum* Scudder. Lateral outline of female subgenital plate. Sabine, Texas. (Same scale as fig. 2.)

Fig. 7.—*Cycloptilum bidens* new species. Dorsal view of male. Cumberland Island, Georgia. (× 6.)

Fig. 8.—*Cycloptilum bidens* new species. Ventral view of female subgenital plate. Cumberland Island, Georgia. (Same scale as fig. 2.)

Fig. 9.—*Cycloptilum bidens* new species. Lateral outline of female subgenital plate. Cumberland Island, Georgia. (Same scale as fig. 2.)

Fig. 10.—*Cycloptilum bidens* new species. Ventral view of female subgenital plate.[20] Bainbridge, Georgia. (Same scale as fig. 2.)

Fig. 11.—*Cycloptilum bidens* new species. Lateral outline of female subgenital plate.[20] Bainbridge, Georgia. (Same scale as fig. 2.)

Plate XXIV

Fig. 1.—*Cycloptilum distinctum* new species. Dorsal view of male. *Type.* Tia Juana, California. (× 6.)

Fig. 2.—*Cycloptilum distinctum* new species. Ventral view of female subgenital plate. *Allotype.* Tia Juana, California. (Greatly enlarged.)

Fig. 3.—*Cycloptilum distinctum* new species. Lateral outline of female subgenital plate. *Allotype.* Tia Juana, California. (Same scale as fig. 2.)

Fig. 4.—*Cycloptilum comprehendens interior* new subspecies. Lateral outline of female subgenital plate. *Type.* Leeds, Utah. (Greatly enlarged.)

Fig. 5.—*Cycloptilum comprehendens fortior* new subspecies. Dorsal view of male. *Allotype.* Six miles north of Ajo, Arizona. (× 6.)

Fig. 6.—*Cycloptilum comprehendens fortior* new subspecies. Ventral view of female subgenital plate. *Type.* Ajo, Arizona. (Same scale as fig. 4.)

Fig. 7.—*Cycloptilum comprehendens fortior* new subspecies. Lateral outline of female subgenital plate. *Type.* Ajo, Arizona. (Same scale as fig. 4.)

Fig. 8.—*Cycloptilum comprehendens comprehendens* Hebard. Dorsal view of male. *Allotype.* Lubbock, Texas. (× 5.)

Fig. 9.—*Cycloptilum comprehendens comprehendens* Hebard. Ventro-caudal outline of female subgenital plate. *Type.* Baculite Mesa, Pueblo County, Colorado. (Greatly enlarged.)

Fig. 10.—*Cycloptilum comprehendens comprehendens* Hebard. Lateral outline of female subgenital plate. *Type.* Baculite Mesa, Pueblo County, Colorado. (Greatly enlarged.)

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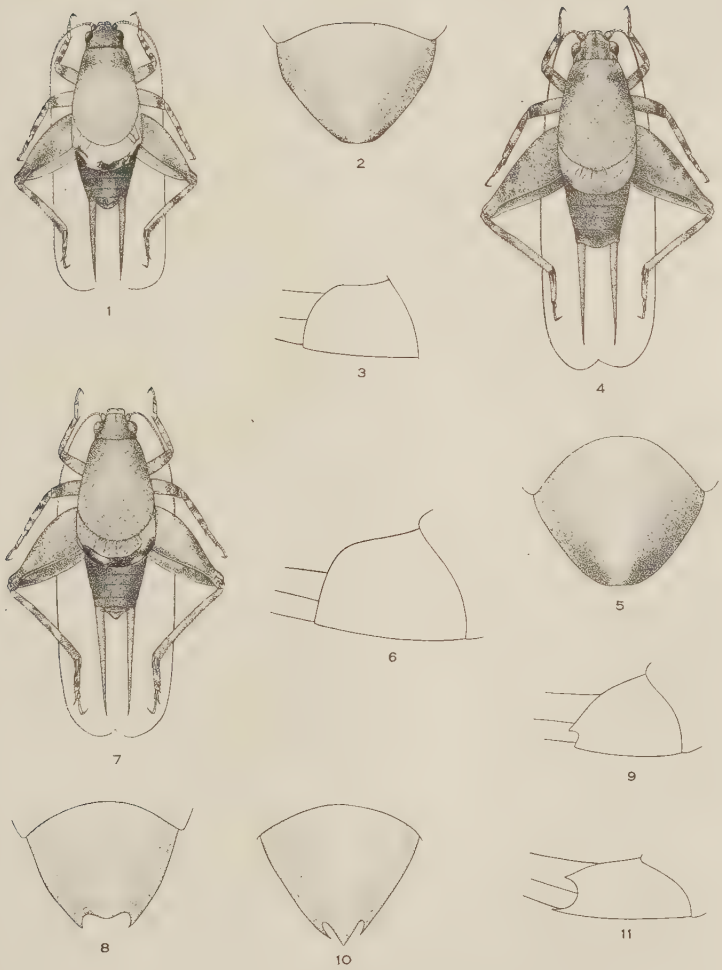
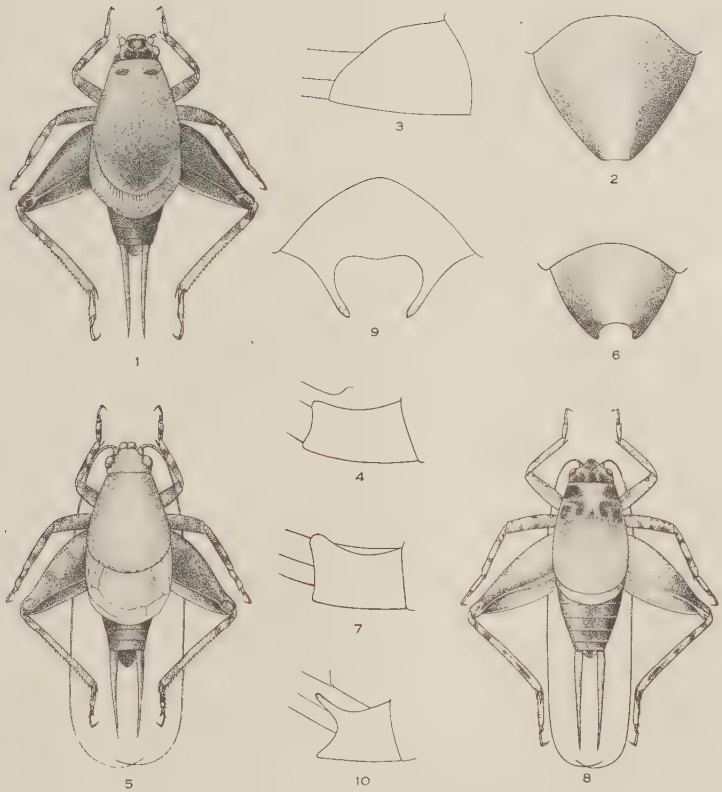
[20] Showing extreme of individual variation in production of meso-distal portion of plate.



HEBARD MOGOPLISTINAE



HEBARD—MOGOPLISTINAE

THE NORTH AMERICAN SPECIES OF HYMENORUS

(COLEOPTERA: ALLECULIDAE)

BY H. C. FALL
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The genus *Hymenorus* is almost wholly confined to the American Continent. According to the Junk Catalog six species only are known from other parts of the world, viz., one each from Central Europe, Central Russia, Greece, Cyprus, India and Japan. In our own fauna it is widely though very unequally dispersed. In the Atlantic Coast States there are a moderate number of species, ranging from five in New England to about twelve in Pennsylvania and twenty or so in Florida and adjacent territory. In the Middle Western and Northwestern States there are very few species but in the Southwest from Texas to Southern California their number is legion. In his treatment of the genus in the "Biologia," Champion remarks that "the headquarters of *Hymenorus* in the New World would appear to be in Mexico, the genus extending northward to the Middle United States and southward to Nicaragua." As at that time some thirty-nine species were known to him from Mexico and Central America while only eleven had been described from the whole United States his statement appeared to be amply justified. At present we may fairly claim Arizona as *Hymenorus* "headquarters," at least the number of species known from that State is greater than from any other equal area on the continent.

As remarked above, at the time that LeConte finished his labors eleven species of *Hymenorus* had been described from our fauna, as recorded in the Henshaw List. As a matter of fact the number of species should be ten instead of eleven inasmuch as the *H. rufipes* of LeConte is not a *Hymenorus* but belongs rather to *Mycetochara*. In the Henshaw List this species is recorded under both *Hymenorus* and *Mycetochares*, and notwithstanding that Casey correctly placed it in the latter genus in his

Cistelidae paper of 1891, it still continues its double roll in the Leng List where in *Hymenorus* it appears as the possible equivalent of *discretus* Csy., a species to which it bears no resemblance whatever.

The forty-six species of *Hymenorus* recognized by Casey in his Revision of 1891 include the ten old species mentioned above, four of Champion's Biologia species—*occidentalis, grandicollis, deplanatus* and *ruficollis*—and thirty-two described by himself as new, two-thirds of which were from the tier of States along the Mexican boundary.

With the exception of *macer* which I have not been able to satisfactorily separate from *punctatissimus* Lec., and *gemellus* which is not different from *deplanatus* Champ., I have accepted all the Caseyan names as representing valid species, though it should be stated that his *pilosus* is not the *pilosus* of Melsheimer nor does his *obscurus* appear to be the *obscurus* of Say.

In the forty years that have elapsed since Casey's paper appeared six additional species only have been described from our fauna, viz.—two by Horn in 1894 (*spinifer* and *planulus*), and four by Blatchley from Florida—*granulatus* (1912), *elbertae* (1918), *dichrous* (1919) and *sabalensis* (1919). Of these, *elbertae* and *sabalensis* appear not to be distinct from *tenellus* and *dorsalis* respectively.

My own study of the genus, pursued intermittently during the past three or four years, was undertaken with a view simply of straightening out my own collection and publishing descriptions of the new species therein contained. To do this however it became necessary to acquaint myself so far as possible with all our previously described species and to add to the usefulness of the work it was decided to include all these in the synoptic table and to at least briefly notice all the older species in the text which follows.

The preparation of a tabular classification for the forty-six species treated by Casey was declared by that author to be "a most difficult and unsatisfactory problem." To say the least the difficulties have not been lessened in the present essay where more than double the number of species is involved. Among primary tabular characters a good deal of stress is laid upon the distance apart of the eyes on the front in the male in terms of

the width of the eye as viewed from the front. Accurate estimates of these distances are a matter of some nicety of observation and the student would do well to check his ability to make them offhand by actual micrometric measurements. In general the tendency is for the eyes to be a little more approximate in the male than in the female but in many species the difference is slight, and individual variation, to which all species are subject, may on occasion quite conceal the normal sexual difference or even reverse it. Here and in numerous other instances the tabular characters are drawn from the male and therefore for purposes of identification it is usually desirable if not imperative that this sex be at hand. In a good series of almost any species the smaller and more slender specimens are likely to be males, and are almost certainly so if the eyes are perceptibly more approximate than in the larger stouter examples. In this connection I wish to call attention to a hitherto wholly unsuspected means of distinguishing the sexes which is applicable to perhaps two-thirds of our species, including practically all the densely punctate forms of the Southwestern States. This consists of a well marked disparity in the number of teeth in the pectination or comb of the claws of the four anterior tarsi. In the males the teeth are more numerous, perceptibly longer, more slender or linear, and more close set; in the female fewer, a little shorter and more widely spaced. In a few species the disparity is notably great; e.g. in *protibialis*, *irritus* and a few others where there are about twenty-four teeth in the protarsal claw of the male and only ten to twelve in the female. In *conformis*, *papagonis* and numerous others there are twelve to fourteen teeth in the male claw and about eight in the female. In the smaller species the teeth are less numerous and the sexual difference is correspondingly less; e.g. *parvus*, ten in the male and eight in the female; *punctatissimus*, nine in the male and six in the female. These numbers of course are not constant in all specimens but so far as observed the individual variation is not great and with a little experience there should be no great difficulty in recognizing the sexes in those species in which this difference in ungual pectination exists. In the more sparsely punctate and shining species of the Northern States the ungual

pectination scarcely varies sexually or the difference is so slight and uncertain as to make the character of little use. Moreover as a rule there is no reliable sexual difference in the interocular distance in these species, so that for a certain determination of sex dissection is necessary unless by chance the genitalia are exposed.

The little group of species *difficilis* to *communis* having the third antennal joint shorter than the fourth has caused me more trouble and perplexity than any other equal number of species in the genus. This is due in part to a misconception of previous authors and in part to a lack of sufficient material for a satisfactory study of the group. As long ago as 1866[1] LeConte announced that "in *H. obscurus* and *communis* the males differ from the females by the third joint of the antennae being but little longer than the second, while in the females the third joint is nearly or quite as long as the fourth." This statement has ever since been accepted without question, but I can say positively that there exists no such sexual difference in the antennae of the two species mentioned by LeConte, nor in two of the three species added by Casey to this group. I cannot doubt therefore that the statement will prove equally erroneous in the only remaining species *difficilis* when, if ever, that species shall be positively identified and females are correctly associated. For further details on this matter see the remarks under the several species of this group.

While in my study of this genus I have not broadcast any general appeal for aid, I have nevertheless received more or less material from a considerable number of correspondents, and I wish therefore to express my hearty appreciation and thanks to Messrs. Blatchley, Dietrich, Dury, Frost, Klages, Liebeck, Loding and Wallis, all of whom responded cheerfully and promptly to requests for specimens. I am indebted also to the authorities of the University of Kansas (containing the Snow collection), Cornell University, and the California Academy of Sciences, for the privilege of studying their entire *Hymenorus* accumulations, that from the last named Institution including the very considerable material of the Blaisdell, Van Dyke and J. O.

[1] Smithsonian Miscel. Coll., VI, No. 167, p. 135.

Martin collections; also material in the collection of The American Entomological Society at The Academy of Natural Sciences of Philadelphia.

I have on several occasions carefully studied the LeConte types in the Museum of Comparative Zoology at Cambridge, and have examined with less deliberation the Casey types at the National Museum. In the latter case my study has been supplemented by carefully prepared notes furnished me by Mr. L. L. Buchanan, Custodian of the Casey collection, in answer to queries concerning certain points on which further information was needed. To Mr. Buchanan and to Mr. K. G. Blair of the British Museum, who kindly sent me for study certain species from the Biologia material, I am especially obligated.

That the genus *Hymenorus* enjoys but a slight measure of popularity with collectors is undeniable. The species are monotonous in aspect, difficult to identify, and so fragile or loosely articulated that they are peculiarly liable to breakage in handling. Because of this fragility a large proportion of the specimens, especially in the older collections, are more or less defective or otherwise unsatisfactory for study, and remounting of old material is almost prohibited by the danger of disintegration during the process.

The sequence of species in the text follows that of the synoptic table though a few species by this arrangement seem somewhat out of place: e.g. *semirufus* and *dichrous* would more naturally be placed next to *dorsalis*, and *parvus* might better be associated with *confertus* and allies.

Unless otherwise noted all types of new species are in the author's collection.

Table of Species

1. Prothorax never very much narrower at base than the base of the elytra, the humeri at most only narrowly exposed; outline in front generally broadly parabolic, the anterior angles feebly defined or undefined 2

   Prothorax smaller, narrower and more quadrate, much narrower than the elytral base, the humeri rather widely exposed 32

2. Entire upper surface polished or at least strongly shining, the pronotal punctuation never very dense; eyes as a rule widely separated, nearly always by a distance equal to or greater than their own width (except *picipennis*).....3

   Upper surface generally more or less dull, the pronotal punctuation closer, often very dense; eyes as a rule much more approximate, rarely distant by as much as their own width.....9

3. Third antennal joint equal or subequal in length to the fourth.....4

   Third antennal joint distinctly shorter than the fourth....8

4. Species of the Atlantic and Mississippi Valley regions.....5

   Species of the Rocky Mts. and Pacific Coast.....7

5. Elytral striae obsolete toward the apex.

   Elytra with a humeral red spot, size very small (about 4.5 mm.).....1. *humeralis* Lec.

   Elytra without distinct humeral spot, the base diffusely rufescent in some examples of *niger*.

   All the elytral intervals with more than a single row of punctures, eyes separated by rather more than their own width.....2. *niger* Melsh.

   Second elytral interval with a single row of punctures, eyes separated by one-half to four-fifths their own width; propleura very sparsely punctate, not strigose.....3. *picipennis* Csy.

   Elytral striae distinct throughout their length.

   Form elongate subdepressed, size small (rarely in excess of 5 mm.); oedagus at apex broad, vertically compressed and strongly curved downward....4. *distinctus* n. sp.

   Form normally convex, generally larger and less elongate; oedagus not apically compressed, finely attenuate and feebly deflexed at tip.....6

6. Prothorax typically and usually slightly inflated posteriorly, the sides rounding in slightly at base; pronotal punctuation finer and sparser, surface between the punctures minutely but usually visibly alutaceous; propleural strigosity fine; genital segment of male with forcep like processes.....5. *pilosus* Melsh.

   Prothorax with sides not appreciably bulging or rounded in basally; pronotal punctuation coarser and closer, the surface polished throughout and usually without visible alutaceous sculpture.

Propleural strigosity (best viewed posteriorly) fine; genital forceps well developed (assumed for *melsheimeri*, the male being unknown).

Prothorax more than two-thirds wider than long, its surface distinctly finely alutaceous, punctuation somewhat finer and sparser....6. *melsheimeri* Csy.

Prothorax not over one-half wider than long, its surface polished, the punctuation coarser and closer.

Form less elongate, size larger (7 mm.), thorax somewhat more transverse, punctuation relatively coarse, disk shallowly biimpressed and with a narrow incomplete median impunctate line (Pennsylvania).....7. *molestus* n. sp.

Form a little narrower, prothorax less transverse, pronotal punctuation moderate, disk without trace of impressions or median impunctate line; 5.2 to 6 mm.....8. *arkansanus* n. sp.

Propleural strigosity coarser; genital segment of male without forcep like processes.

Size larger—6.3 to 8.2 mm., rarely under 7 mm. (New England to Texas).....9. *obesus* Csy.

Size smaller—5.25 to 6.8 mm.; pronotal punctuation a little closer as a rule, oedagus more finely attenuate at tip (Southern Mississippi and Alabama) 10. *dubius* n. sp.

7. Form normally oblong-oval.

Prothorax more obliquely narrowed from the base, less transverse and more sparsely finely punctate; color blackish brown (British Columbia) 11. *caurinus* n. sp.

Prothorax shorter with sides subparallel basally; punctuation distinctly closer, color brown.

Eyes separated as a rule by one-fifth to two-fifths more than their own width (Southern California) 12. *infuscatus* Csy.

Eyes separated usually by three-fifths to four-fifths more than their own width; prothorax typically slightly shorter and even more densely punctate (California, Central Valley)...13. *punctulatus* Lec.

Form more elongate and parallel.

Color reddish castaneous, strongly oblong in outline, the thorax subequal in width to the elytra; propleura sparsely punctate (California)....14. *ulomoides* n. sp.

Color black or brownish black, prothorax more quadrate and much narrower than the elytra; propleura densely punctate without trace of longitudinal strigosity.

Prothorax less than one-half wider than long; last joint of maxillary palpi in the form of a right triangle as usual, with the apex straight and as long as the outer side.

Sides of thorax broadly feebly sinuate before the hind angles; legs brownish (British Columbia) 15. *sinuatus* n. sp.

Sides of thorax not at all sinuate posteriorly; legs black (California).....var. *ebeninus* n. var.

Prothorax rather more than one-half wider than long; last joint of maxillary palpi with the apex arcuate, the base angle less than right.

Eyes (♀) separated by one-fourth more than their own width; legs red (New Mexico) 16. *macilentus* n. sp.

Eyes (♂) separated by two-thirds their own width; legs black (Southern Arizona)..17. *atratus* n. sp.

8. Third antennal joint distinctly shorter than the fourth and to nearly the same degree in the sexes, though sometimes relatively slightly shorter in the male, in which sex the outer apical angles of the joints are often a little better defined, giving a feebly serriform appearance which is not or scarcely perceptible in the female.

Third antennal joint two-thirds to three-fourths as long as the fourth.

"Antennae one-half as long as the body, the intermediate joints strongly obconical and scarcely twice as long as wide; prothorax long and subequal in width to the base of the elytra"..18. *difficilis* Csy.

Antennae one-half as long as the body, distinctly serriform externally in the male, intermediate joints longer and less strongly obconic; prothorax perceptible narrower than the base of the elytra 19. *perforatus* Csy.

Antennae about two-fifths the length of the body, scarcely at all serriform in the male, the intermediate joints feebly obconic to almost parallel sided.....20. *obscurus* Say

Third antennal joint about one-half as long as the fourth, intermediate joints feebly or moderately obconic and slightly serriform in the male.

Third joint (♂) one-half as long as the fourth, form of body broader, thorax at base perceptibly narrower than the base of the elytra.....21. *illusus* n. sp.

Third antennal joint rather less than half the length of the fourth; prothorax shorter than usual, slightly expanded basally and as wide as the base of the elytra.....22. *curticollis* Csy.

Third antennal joint about one-half the length of the fourth, thorax not as wide as the base of the elytra; size small (4.8 to 6 mm.); color generally paler, reddish brown.....23. *communis* Lec.

9. Protibiae unmodified in the male.....11

Protibiae of male with a more or less distinct swelling or tumidity on the postero-interior margin above the middle.....10

10. Protibiae of male with two swellings, one at the extreme base on the inner side, the other above the middle and more external; sutural angles feebly sinuate externally and a little produced.....24. *bitumescens* n. sp.

Protibiae of male with a single tumidity.

Comb of protarsal claw in male with 20 to 24 teeth (except *grandicollis*—about 16 to 18 teeth); eyes in the male separated on the front by not more than the width of the second antennal joint, or by not more than one-fifth their own width; size at least moderately large (7–12 mm.).

Protibial swelling well marked.

Sutural angle acute and more or less produced (Arizona).....25. *spinifer* Horn.

Sutural angle normal, not acutely produced, size smaller (7.25 to 8.25 mm.); Colorado Desert, California.....26. *protibialis* n. sp.

Protibial swelling feeble or incipient.

Lateral margins of propleura flattened and subhorizontal; length 7.5 to 8 mm. (Lower California).....27. *cassus* n. sp.

Lateral surface of propleura normally oblique, not appreciably flattened except at the hind angles; length 6.9 to 7.3 mm. (Arizona)
28. *grandicollis* Champ.

Comb of protarsal claw of male with about 16 to 18 teeth; eyes less approximate, separated in the male by not less than one-fourth their own width, or by distinctly more than the width of the second antennal joint.

Color dark brown to piceous, eyes less approximate, separated by one-third their width in the male and around one-half their width in the female; prothorax somewhat more strongly punctate; length 6.4 to 7.5 mm. . . . . 29. *porosicornis* Csy.

Color rufotestaceous to pale brown, eyes a little closer, separated by one-fourth their width in the male; prothorax somewhat more finely punctured; length 5.8 to 6.3 mm. . . . . 30. *helvinus* Csy.

11. Eyes in the male separated by one-fifth to one-third their own width. 12

Eyes in the male separated by three-eighths to one-half their own width. 15

Eyes in the male separated by three-fifths to five-sixths their own width (by fully their own width in some examples of *tenellus* and *punctatissimus*). 20

Eyes in the male separated by a distance equal to or greater than their own width (slightly less than their width in the male and a little more than their width in the female of *simiolus*). 26

12. Propleura smoother externally. 13

Propleura equally densely sculptured to the outer margin. . 14

13. Protarsal claw of male with about 24 teeth; sutural angle of the elytra sinuately more or less prominent (Colorado Desert, So. California). . . . . 31. *irritus* n. sp.

Protarsal claw of male with about 13 to 16 teeth; sutural angle not prominent.

Metasternum in the male with two small longitudinal erosions posteriorly (Western Texas) 32. *conformis* n. sp.

Metasternum of male without erosions. . . 33. *vigilax* n. sp.

14. Pronotum extremely densely and rather coarsely punctate; ventral segments 1–3 of male broadly closely punctate medially and each with an area at middle of still finer denser punctures; protarsal claw of male with 12–14 teeth. . . . . 34. *papagonis* n. sp.

Pronotum equally densely but perceptibly more finely punctate; ventral segments 1–3 similarly densely punctate medially but without clearly marked small areas of still

finer more closely aggregated punctures; comb of protarsal claw of male with about 14–16 teeth
35. *apacheanus* Csy.

Pronotum very densely punctate, protarsal claw of male with about 10 teeth; ventral segments of male not apparently more densely punctured at middle; size much smaller (4.6 to 5 mm.); Lower California
36. *parvus* n. sp.

15. Comb of protarsal claw of male with 18 to 20 or more teeth.....16

Comb of protarsal claw of male with about 10 to 13 teeth (8 only in *fuscipennis*).....17

16. Color as in *dorsalis*, rufous or rufocastaneous with the posterior two-thirds of the elytra black (Florida)
37. *semirufus* n. sp.

Color above nearly uniform and of some shade of brown.

Size very large (10–11 mm.); pronotum coarsely very densely punctate (Texas)....38. *occidentalis* Champ.

Size moderately large (7.8–10 mm.); pronotal punctuation distinctly less coarse.

Prothorax less transverse (less than one-half wider than long, at least in the male); ventral segments in the male not distinctly more closely punctate at middle than at sides.

Pronotum more densely and evidently more coarsely punctate (Lower California)..39. *capensis* n. sp.

Pronotum rather finely and less densely punctate (Arizona and New Mexico)....40. *prolixus* Csy.

Prothorax more transverse (fully one-half wider than long); ventral segments 1–3 (more especially 1–2) in the male more finely and densely punctate at middle (Southern California)...41. *jacobinus* n. sp.

Size much smaller (5–5.5 mm.), form narrower; hind tibiae of male somewhat dilated and compressed in apical half (Southern Arizona)..42. *digressus* Champ.

17. Species of the region from Western Texas and New Mexico to Lower California.....18

Species of the Atlantic region—Massachusetts to Florida..19

18. Size moderate to rather large (6–8.8 mm.).

Metasternum finely and densely punctate at middle.

Antennae rather slender, median joints fully twice as long as wide.....43. *montivagus* n. sp.

Antennae appreciably shorter, stouter and more serriform, median joints less than twice as long as wide.

Prothorax narrowed from the base; propleura densely sculptured and dull throughout (Nevada to New Mexico).....44. *inutilis* n. sp.

Prothorax with sides parallel in basal half; propleura in great part sparsely punctate and shining (Lower California).....45. *planulus* Horn.

Metasternum distinctly more coarsely and sparsely punctured (Arizona).....46. *nitidipennis* Csy.

Size small (3.5 to 5.5 mm.).

Intermediate antennal joints nearly twice as long as wide; size larger (5.5 mm.).....47. *discrepans* Csy.

Intermediate antennal joints about one-half longer than wide; first three ventral segments of male each with a very finely densely punctate and pubescent area at middle; length 3.5–5 mm.....48. *exiguus* Csy.

Intermediate antennal joints not much longer than wide; first ventral segment only of the male with a small densely punctate and pubescent area; length 3.7–4.6 mm.....49. *trivialis* n. sp.

19. Comb of protarsal claw of male with about 8 teeth; head and thorax rufous, elytra dark brown, size small (4.6 mm.); Florida.....50. *fuscipennis* n. sp.

Comb of protarsal claw with about 14 teeth in the male and 8 in the female.

Head, thorax and basal third of elytra more or less reddish, apical two-thirds of elytra piceous (Florida) 51. *dorsalis* Sz.

Color above uniformly brown or piceous.

Larger and more robust, prothorax more than one-half wider than long (Maine to New Jersey, Indiana) 52. *discretus* Csy.

Smaller and narrower, prothorax less than one-half wider than long (Florida, Southern Alabama) 53. *caducus* n. sp.

20. Species of the region of Western Texas to Lower California . 21

Species of the region adjacent to the South Atlantic Coast and Gulf of Mexico.....25

21. Elytra flavotestaceous, the prothorax nearly concolorous in the female but in the male much darker, brown to piceous; propleura not smoother externally; first three ventrals in the male finely densely punctate at middle 54. *thoracicus* n. sp.

Color rufotestaceous; form rather broadly oval and strongly convex; median antennal joints twice as long as wide or very nearly so; propleura smoother externally
55. *testaceus* Csy.

Color pale brown to piceous, uniform throughout and not differing in the sexes; form more oblong and less convex.....22

22. Ventral segments not or but slightly more finely and densely punctate at middle in the male.....23

First two or three ventral segments in the male conspicuously more finely densely punctate at middle or with a small median finely punctate area; propleura closely punctate to the extreme margin; antennae short and stout, the median joints less than one-half longer than wide....24

23. Antennae slender, the median joints rather more than twice as long as wide.

Surface shining, alutaceous sculpture nearly wanting, punctuation relatively coarse and sparse
56. *disparatus* n. sp.

Surface distinctly alutaceous and dull, punctuation fine and dense.....57. *oblivius* n. sp.

Surface dull, body larger and stouter, metasternum much more coarsely punctate.....58. *alienus* n. sp.

Antennae less slender, median joints never fully twice as long as wide.

Elytra strongly shining, intervals rather sparsely punctate; pronotal punctures coarse, closely crowded, lustre dull; form convex; median joints of antennae not quite twice as long as wide.....59. *inaequalis* Csy.

Entire surface alutaceous and more or less dull.

Propleura sparsely punctate and comparatively smooth.

Elytral interspaces very sparsely punctured, the punctures tending to form single series posteriorly; size rather large (8 mm.).....60. *idoneus* n. sp.

Elytral interspaces much more numerously punctate; size smaller (6–7 mm.); form distinctly depressed; median joints of antennae one-half longer than wide.....61. *tritus* n. sp.

Propleura more completely punctate, the punctures however somewhat sparser externally.

Median joints of antennae not quite twice as long as wide.....62. *incertus* n. sp.

Median joints of antennae one-half longer than wide; form a little narrower, prothorax less transverse; eyes less distant.....63. *intermedius* n. sp.

Propleura densely punctate to the outer margin; antennae short and stout, median joints not more than one-third longer than wide...64. *indutus* Csy.

24. Punctuation of upper surface finer and denser, the elytral intervals notably more numerously punctate; median antennal joints distinctly less than one-half longer than wide.....65. *punctatissimus* Lec.

Punctuation coarser, the elytral intervals especially more coarsely and less densely punctate; median joints of antennae a little more elongate though scarcely a half longer than wide.....66. *confertus* Lec.

25. Color throughout deep black; form elongate; above coarsely sculptured, the elytral interspaces granulately rugose; third antennal joint but little more than half the length of the fourth.....67. *granulatus* Blatch.

Color nearly as in *dorsalis*, the head, thorax and basal third of the elytra dark red or castaneous, the apical two-thirds of elytra blackish; second and third antennal joints subequal.....68. *dichrous* Blatch.

Color variable but never black, legs concolorous or paler; elytra not granulate; third antennal joint at least as long as the fourth.

Form elongate oval.

Prothorax usually rufous, elytra darker, brown or piceous, rarely upper surface throughout brown or piceous; antennae blackish except at base; elytral striae finer and not coarsely punctured 69. *densus* Lec.

Upper surface entirely dark brown or piceous; antennae rufo-ferruginous; elytral striae unusually deep and coarsely punctate; size larger....70. *convexus* Csy.

Form more parallel and elongate; elytral striae and strial punctures very fine.

Size larger (6 mm.); form convex; color above uniformly brown; antennae a little more slender 71. *tenuistriatus* n. sp.

Size smaller (4.8 to 5.5 mm.); less convex; color rufo-ferruginous, the elytra and posterior ventral segments usually darker.....72. *tenellus* Csy.

26. Species of the region from Western Texas to Lower California.....27
    Species of the Atlantic and Gulf Coast regions.....31
27. Propleura more sparsely punctured and smoother externally.....28
    Propleural sculpture of practically equal density throughout the width.....30
28. Antennae compressed, rather broad medially, becoming distinctly attenuate apically; punctuation very fine throughout.....73. *fusicornis* Csy.
    Antennae only feebly compressed as usual and not evidently attenuate.
        Prothorax slightly inflated toward the base and rather wider than the base of the elytra.
            Elytra with distinct series of punctures; color piceous black; head distinctly rather closely punctate 74. *rotundicollis* Csy.
            Elytra with scarcely a trace of punctured series or impressed lines; color pale; head extremely finely and sparsely punctured.....75. *inquilinus* Csy.
        Prothorax not inflated basally and not wider than the elytral base.....29
29. Elytral striae well impressed and coarsely punctate; body widest a little behind the middle.....76. *seriatus* Csy.
    Elytral striae moderate or fine, strial punctures much finer.
        Form broadly evenly oval; color piceous brown; size larger (7 mm.).....77. *brevis* n. sp.
        Form rather narrowly evenly oval; color rufotestaceous; size smaller (5 mm.).....78. *rufovalis* n. sp.
        Form narrower and more oblong.
            Middle tibiae of male rather abruptly dilated apically 79. *deplanatus* Champ.
            Middle tibiae of male not modified.
                Size moderate (6.2 to 7.9 mm.); prothorax of usual form; color dark brown.....80. *simiolus* n. sp.
                Size very small (4 mm.); form narrow; prothorax more quadrate and less nearly equal in width to the elytral base; color nearly black with reddish legs.....81. *exilis* n. sp.
30. Form oval, convex; antennae comparatively stout, median joints at most only one-half longer than wide; small species.

Elytra dark brown or piceous, head and thorax more or less rufo-ferruginous; striae finely punctured
82. *ruficollis* Champ.

Color nearly uniform throughout; strial punctures coarse.

Strial punctures moderately coarse; pronotal punctures coarse and dense, in mutual contact or nearly so throughout (Lower California)....83. *facetus* n. sp.

Strial punctures very coarse; pronotal punctures distinctly separated, the interspaces strongly granulato-reticulate and dull; smaller and a little more elongate (Galveston, Texas).....84. *dissensus* Csy.

Form more elongate; antennae more slender, median joints nearly or quite twice as long as wide (a little shorter in *fusculus*); strial punctures much finer.

Pubescence unusually long and suberect
85. *horrescens* n. sp.

Pubescence shorter and much inclined.

Size large (8 to 8.5 mm.); head throughout very densely punctate.....86. *milleporus* n. sp.

Size much smaller (5.5 to 6 mm.).

Metasternum of male very densely finely punctate except narrowly along the outer margin where it becomes abruptly coarser; first ventral of male not finely densely punctate at middle
87. *nevadensis* n. sp.

Metasternum of male in its posterior half with a median oval densely punctate and pubescent area which is narrowly divided on the median line; first ventral not densely punctate at middle
88. *significans* n. sp.

Metasternum of male normally punctate; first ventral with denser finer puncturation at middle
89. *fusculus* Csy.

31. Size larger (5.5 to 7.3 mm.); legs pale rufo-ferruginous to brownish red.

Prothorax only about one-third wider than long, subconical, sides nearly straight and convergent from base for three-fourths their length
90. *conicicollis* n. sp.

Prothorax distinctly more transverse, sides normally rounded.

Size larger (7.3 mm.); form nearly evenly oval, not at all widened posteriorly; third and fourth antennal joints equal.....91. *quietus* n. sp.

Size smaller, length rarely but little more than 6 mm.; elytra with a tendency toward a feeble inflation posteriorly.

Third antennal joint a little longer than the fourth.

Apical margin of pygidium in female entire.

Antennae entirely pale rufo-ferruginous 92. *floridanus* Csy.

Antennae more or less dusky brown or piceous except at base.....93. *texensis* n. sp.

Apical margin of pygidium in female triangularly notched.....94. *heteropygus* n. sp.

Third and fourth antennal joints equal or very nearly so; apical margin of pygidium in female entire 95. *inopiatus* n. sp.

Size smaller (4.8 to 5.5 mm.); prothorax more transverse; legs piceous brown; pygidium of female notched at apex.....96. *sobrinus* Csy.

32. Pubescence long, suberect and bristling; median joints of antennae about one-half longer than wide; elytral interspaces uniseriately punctate; last two ventral segments less punctate than those preceding.

Eyes scarcely as widely separated beneath as above 97. *uniseriatus* Csy.

Eyes much more widely separated beneath than above; size usually a little larger, vestiture longer 98. *crinitus* n. sp.

Pubescence recumbent or short and inconspicuous; median joints of antennae more than twice as long as wide; elytral interspaces more or less confusedly punctate; last two ventral segments as closely punctate or more closely so than those preceding.

Eyes more widely distant beneath than above; elytral striae nearly obsolete except toward the sides and apex.....99. *liebecki* n. sp.

Eyes less widely distant beneath than above; elytral striae distinctly impressed throughout 100. *quadricollis* n. sp.

1. Hymenorus humeralis LeConte

1866. *Hymenorus humeralis* LeConte, Smiths. Misc. Coll., VI, no. 167, p. 135. (New Species of No. Am. Col., pt. I, 2d Ed.).

This little species is unique in our fauna in the possession of a distinct though not sharply outlined red humeral spot which extends somewhat obliquely inward but does not reach the

suture. The size is small, ranging in the few specimens seen from 3.8 to 5 mm. in length. LeConte's unique type measured 4.5 mm. and is from Kentucky. It is recorded by Dury in his Cincinnati List (his specimens may also have been taken in Kentucky) and by Hamilton in the Southwestern Pennsylvania List. I have also seen examples collected by Löding in the vicinity of Mobile, Alabama. It seems to be everywhere rare.

2. **Hymenorus niger** (Melsheimer)

1806. *Cistela nigra* Melsheimer, Cat. Ins. Penna., p. 25, no. 526. [nom. nud.].

1846. *Mycetochares niger* Melsheimer, Proc. Ac. Nat. Sci. Phila., III, p. 59.

Within limits there is exhibited a good deal of variation in minor details in the aggregate accepted as *niger* in our collections. Melsheimer describes his species as black with rufous legs, but the elytra at base are frequently more or less rufescent and are rarely truly black, being rather fuscous varying to paler brown, the legs varying from brown to flavate. The principal specific character is the almost complete obliteration of the elytral striae posteriorly especially toward the sides and at apex. The same thing occurs in *humeralis* and *picipennis* but these species are separable by other characters.

Casey expressed the belief that his series of *niger* embraced about six probably distinct species which however he was at the time unable to define. I think it probable that my own series of this species is complex but if so I am equally unable as yet to determine the limits of the separate units. In the series before me the length varies from 5.2 to 7 mm.

As at present understood the species ranges widely in the eastern half of our territory from New England through Southern Canada to Minnesota, and south to Florida and Texas.

3. **Hymenorus picipennis** Casey

1891. *Hymenorus picipennis* Casey, Ann. N. Y. Acad. Sci., VI, p. 90. (Coleop. Notices, III).

A species of medium size, and at long range similar in general aspect to the commoner *pilosus* and *obesus*. On closer inspection however it proves to be one of our most distinctly characterized species. Its principal structural features are—eyes distant in male by about one-half, and in female by about four-fifths their

width; antennae in the male distinctly serriform, the third joint perceptibly longer than the fourth; prothorax unusually sparsely punctate; propleura smooth, with very few punctures; elytral striae almost obliterated posteriorly, the second interspace with a single regular series of punctures. The last named character is of especial value and will I believe prove definitely diagnostic in all cases. The width of the front between the eyes is somewhat variable in both sexes.

Casey's type was from Michigan. I have seen examples from Aylmer, Quebec, (*Pinus strobus*—reared, F. C. Craighead); Farmington, New Hampshire; Staten Island, New York; Jeannette, (Klages), Pennsylvania; Berrien Co., Michigan; Wisconsin; Mobile, (Löding), Alabama.

4. **Hymenorus distinctus** new species

Narrowly oblong-oval, subdepressed, ferruginous to dark brown, shining; pubescence yellowish, rather short; eyes distant on the front by a little more than their own width, scarcely differing in the sexes. Antennae ferruginous, not at all serriform in the male, third and fourth joints equal, intermediate joints slightly obconic, about twice as long as wide.

Prothorax scarcely two-fifths wider than long in the male, usually slightly shorter in the female, sides parallel or very faintly dilated basally, disk evenly rather strongly punctate, the punctures distant as a rule by their own diameters.

Elytra at base scarcely visibly wider than the thorax, twice as long as wide, subparallel in basal two-thirds; striae finely impressed, strial punctures rather coarse and close set, intervals strongly conspicuously punctate, about two punctures as a rule in the width of the interspace.

Propleura sparsely punctate and minutely strigose, metasternum and abdomen polished, rather sparsely punctate; basal joint of hind tarsus much longer than the remainder.

Length, 4.4 to 5.3 mm.; width, 1.75 to 2.2 mm.

Described from a series of eleven examples from Marion County, Florida, Mobile, Alabama and vicinity, (Löding), and Lucedale, Mississippi, (Dietrich). The type is a male from the last named locality.

This little species, though not very nearly related, is somewhat similar to *communis* and is mixed with the latter in the LeConte collection, and may go under this name elsewhere. *Communis* differs at once by its short third antennal joint, and is rather

more convex and with longer less recumbent pubescence. The genitalia are quite different, the oedagus in the present species being remarkably broad, vertically compressed, and strongly curved downward at apex.

5. **Hymenorus pilosus** (Melsheimer)

1846. *Allecula pilosa* Melsheimer, Proc. Acad. Nat. Sci. Phila., III, p. 58.

This species and *obesus* Csy. are the only two common species of fairly large size occurring in the Northeastern States. Melsheimer was evidently unacquainted with the species later named *obesus*, and his description of *pilosus* has very little discriminative value. As a matter of fact the *pilosus* of the LeConte collection is *obesus;* the *pilosus* of the Casey collection is merely a smaller form of his own *obesus*, and in collections in general the name is indiscriminately applied. Fortunately it has been possible to determine the true *pilosus* from the Melsheimer collection and it is hoped that the somewhat detailed tabular characters will serve for its recognition. It is fair to state however that certain variants from the typical form are rather disconcerting. For example, individuals occur in which the typical feeble posterior bulging of the sides of the prothorax is scarcely evident, and in these the characteristic very fine alutaceous ground sculpture of the pronotum may nearly or quite disappear, and the pronotal punctuation may be somewhat coarser than normal. These are variations in the direction of *obesus*, but the finer strigosity of the prothoracic flanks forbids association with the latter.

It is of course possible that the variations above mentioned, which for the present are held to lie within the limits of *pilosus*, really indicate one or two closely allied but distinct species. A very distinct tendency for the ventral segments except at apex to become brighter castaneous or rufescent has been noted in the females of *pilosus*. The males do not show this nor have I noticed it in either sex of *obesus*.

Pilosus is one of our most widely dispersed species in the Eastern United States and Southern Canada. It is comparatively scarce in New England but seems to be not rare in New York, New Jersey and Pennsylvania. I have seen examples also from Ohio, Indiana, Michigan, Arkansas, Louisiana and

Alabama. It is recorded in both the Iowa and Kansas State Lists and very likely correctly so.

In size the specimens from the more northern States range as a rule from 7 to 7.5 mm. in length, the southern examples being usually somewhat smaller. A series in my collection from Arkansas, (Hope) and Louisiana, (Winnfield) measures only 5.5 to 6.5 mm. but seems to conform otherwise; moreover I have seen nearly as small individuals from New York and Rhode Island, while the largest specimen in my series is from Louisiana.

6. **Hymenorus melsheimeri** Casey

1891. *Hymenorus melsheimeri* Casey, Ann. N. Y. Acad. Sci., VI, p. 92. (Coleop. Notices, III).

This species is known to me only by the unique type in the Casey collection. At present two other specimens stand with the type, having been added by Casey at some later time, but neither one is the same as the type. One of these (Michigan) is *pilosus*, the other (Indiana) I provisionally regard as the *molestus* of the present paper.

Although Casey in his writings often emphasized the necessity of precise measurements, I have in numerous instances found him seriously inexact in such matters. The present species is a case in point. In his description he states that the antennae are "not more than one-third the length of the body, the last three joints rapidly shorter; the prothorax three-fourths wider than long; the punctures separated by about three times their own diameters; the basal joint of the hind tarsus nearly one-half longer than the remainder." My own observation of the type, supplemented by careful micrometric measurements by Mr. Buchanan, shows that the antennae are three-eighths the length of the body, the three outer joints not or scarcely perceptibly decreasing in length; the prothorax is .68 wider than long, with the punctures separated from one to two times their own diameters, the average being nearer one than two; the basal joint of the hind tarsus a little less than one-fourth longer than the remainder.

The type of *melsheimeri* is from "Mich." and is probably a female.

7. **Hymenorus molestus** new species

Oblong-oval, moderately elongate, luteo-pubescent, integuments polished. Head rather sparsely punctate; eyes (♂) separated by a distance more than one-half greater than their own width. Antennae about two-fifths the length of the body, rather stout, filiform, joints five to ten almost perfectly parallel sided, and one-half to two-thirds longer than wide.

Prothorax not quite one-half wider than long, sides convergent and nearly straight from base to apical third, thence rounding more rapidly into the apex; disk with a distinct but shallow impression each side just behind the middle; punctuation rather coarse, nearly evenly dispersed, the punctures separated on the average by somewhat more than their diameters, a short narrow impunctate line at middle.

Elytra slightly wider at base than the thorax, sides parallel in about basal half, just perceptibly widened submedially; striae lightly impressed, moderately punctate; intervals sparsely much more finely punctate.

Propleura sparsely punctate except in front, not perceptibly smoother along outer margin, finely strigose posteriorly; metasternum and abdomen punctate about as usual in this group; comb of protarsal claw with about ten teeth.

Length, 7 mm.; width, 2.5 mm.

Jeannette, Pennsylvania, (VI–28).

Described from a unique male specimen collected and given me by Mr. H. G. Klages.

The male genital characters are very nearly as in *pilosus* but the sides of the thorax convergent from the base and without trace of the slight posterior inflation characteristic of the latter give it a distinctly different appearance. The much coarser and less sparse pronotal punctuation with the integuments everywhere polished is not approached in any specimen of *pilosus* which I have seen, even in those occasional specimens in which the posterior inflation of the sides nearly disappears.

One of two examples which was later placed by Casey with his unique type of *melsheimeri* is very similar to the present species and I should tentatively so consider it. It has the postmedian impressions as here described, but lacks the median impunctate line, which is probably no more than an individual character. This specimen is from Indiana.

8. **Hymenorus arkansanus** new species

Narrowly elongate-oval, dark fuscous, integuments polished, pubescence rather long and conspicuous, dull yellow. Head strongly punctured, eyes (♂) separated by barely their own width. Antennae a little less than half as long as the body, third and fourth joints equal, following joints slightly shorter and feebly obconic.

Prothorax very nearly one-half wider than long, obtusely rounded in front, sides nearly straight and slightly converging from the base to the middle; punctures rather fine and separated by about twice their own diameters on the average.

Elytra slightly more than three and one-half times as long, and at base scarcely perceptibly wider than the thorax, but medially about one-fifth wider than the latter. Striae lightly impressed, becoming still more feebly so toward the apex; strial punctures close and moderately strong toward the base, becoming nearly as fine as those of the interspaces on the apical declivity. Body beneath piceous, legs fuscous, the tarsi dull rufous.

Length, 5.5 to 6.5 mm.; width, 2 to 2.6 mm.

Described from two examples taken at Hope, Arkansas, V, 23–24, 1926 by Miss Louise Knobel. The type and smaller specimen is a male; the larger example may also be a male, at least there is no difference in the size of the eyes.

This little species shows affinities with both *pilosus* and *obesus* as is manifest from the tabular characters and its proper position is between these two. The eyes are a little less widely separated than in any of the allied species but this character is subject to some variation and more examples are needed to test the value of the character in the present case.

9. **Hymenorus obesus** Casey

1891. *Hymenorus obesus* Casey, Ann. N. Y. Acad. Sci., VI, p. 93. (Coleop. Notices, III).

1891. *Hymenorus pilosus* Casey, nec Melsheimer, Ann. N. Y. Acad. Sci., VI, p. 93.

This species agrees in average size with *pilosus* and occupies about the same territory. The two may be definitely distinguished by the genital characters of the male as indicated in the table, but in general the entirely polished more numerously and more coarsely punctate thorax, which is not quite so wide at base, will enable *obesus* to be recognized.

Obesus is our only common species of the genus in New England, where it occurs under loose bark and may be collected by beating dead branches. It is frequent also in New York, New Jersey and Pennsylvania, and is known to me from Virginia, North Carolina, Michigan, Missouri, Alabama, Louisiana and Texas.

The species shows a considerable amount of variation throughout its range and it is quite possible that one or two other closely allied species are at present confused under this name. I have separated as distinct a smaller southern form under the name *dubius,* but do not feel certain that it is anything more than a small race of the present species.

10. **Hymenorus dubius** new species

Oblong-oval, blackish brown, surface polished, not at all alutaceous, pubescence pale ochreous, rather long and abundant inclined.

Head moderately strongly and closely punctate; eyes separated by a little more than their own width in the male, usually perceptibly more distant in the female. Antennae slender, filiform, about two-fifths the length of the body, third and fourth joints subequal, intermediate joints slightly obconical and about twice as long as wide.

Prothorax three-fifths wider than long, sides broadly arcuately convergent from the base; punctuation moderate, the punctures distant on the average by about their own diameters.

Elytra at base scarcely or barely visibly wider than the base of the thorax, sides feebly arcuate and subparallel to behind the middle in the male, often faintly widened posteriorly in the female; striae moderate, intervals sparsely rather coarsely punctate.

Propleura rather coarsely punctate and strigose; metasternum and abdomen polished and rather sparsely and strongly punctured as in the allied species; basal joint of hind tarsus subequal to or a little longer than the remainder.

Length, 5.25 to 6.8 mm.; width, 2.4 to 2.75 mm.

MISSISSIPPI: Lucedale, (H. Dietrich); ALABAMA: Mobile and vicinity, (H. P. Löding). The type is a male from the first named locality and bears date V–7–1929.

This species is to all appearances a diminished replica of *obesus,* but the consistently smaller size, the largest specimens no more than equalling the smallest of *obesus,* combined with the

exclusively southern habitat, suggests at least a well established subspecies. Moreover dissecting out the genitalia shows that there is a small difference in the form of the oedagus, this being in the present form more finely attenuate than in *obesus*, and I am therefore assuming the two to be distinct.

11. **Hymenorus caurinus** new species

Oblong-oval, moderately strongly convex, piceous black above and beneath, legs dark fuscous, the tarsi paler; integuments strongly shining, not alutaceous; pubescence rather short, dull fulvous.

Antennae piceous, basal two joints paler, slender, about two-fifths the length of the body, third joint perceptibly longer than the fourth, intermediate joints feebly obconic and very nearly twice as long as wide. Head finely rather sparsely punctate; eyes (♂) separated by one-fourth more than their own width.

Prothorax two-fifths wider than long, distinctly less wide at base than the base of the elytra, sides gradually arcuately divergent almost to the extreme base, hind angles rectangular; punctuation fine and sparse, the punctures distant as a rule by twice their own diameters or nearly so, not closer at sides.

Elytra twice as long as wide, three and one-half times as long and at middle almost one-fourth wider than the thorax; striae lightly but quite perceptibly impressed throughout, closely not coarsely punctate; intervals more finely punctate, with two to three punctures in their width.

Propleura punctate rather sparsely and without strigosity; ventral segments 1–3 moderately sparsely punctate; basal joint of hind tarsi fully equal in length to the remainder.

Length, 6.5 mm.; width, 2.75 mm.

Described from a single male specimen sent me by Mr. J. B. Wallis, who collected it at Peachland, British Columbia, July 21, 1919.

The less distant eyes and the longer and much more sparsely punctate thorax easily separate this species from *punctulatus* and *infuscatus*. It agrees more nearly in outline and appearance with some of the smaller forms of *obesus*, but this latter has a more coarsely and closely punctate thorax, the third antennal joint not longer than the fourth, and inhabits a totally different faunal area.

12. **Hymenorus infuscatus** Casey

1891. *Hymenorus infuscatus* Casey, Ann. N. Y. Acad. Sci., VI, p. 90. (Coleop. Notices, III).

The unique type of this species in the Casey collection has unfortunately lost its head; I am well satisfied however that a series of specimens in my own collection otherwise in agreement and from the type region are specifically the same. The species runs very close to *punctulatus* but may prove to be distinct. In addition to the tabular characters it may be said that the antennae are typically a little shorter in *punctulatus* and the male copulatory organ in that species is perceptibly narrower and more gradually acuminate. Casey gives as a distinguishing character the longer pubescence in *infuscatus*, but I do not find any appreciable difference of this kind. The eyes are rather small and widely separated in both species but seem generally more remote in *punctulatus*. In both species their distance apart varies considerably and the sexes show no consistent difference in this respect.

Infuscatus occurs not infrequently in Southern California. The type locality is Los Angeles. My own series is from Santa Barbara, Pasadena, Pomona, Santa Catalina Island, San Diego and Campo.

13. **Hymenorus punctulatus** (LeConte)

1859. *Allecula punctulata* LeConte, Proc. Acad. Nat. Sci. Phila., 1859, p. 58. (Cat. of Col. of Ft. Tejon, Cal.).

This species has been discussed somewhat above under *infuscatus*. The most useful single character seems to be the more widely separated eyes, which so far as seen are distant by more than one and one-half times their own width, and in *infuscatus* by rather less than one and one-half times the ocular width as seen from the front. *Punctulatus* is also somewhat more northern in range, all specimens seen being from the Central Valley of California or its adjacent foot hills.

Localities known to me are Fort Tejon (type); Visalia, Tulare County; Athlone, Merced County; Mokelumne Hill. A good series from the last named locality, collected by Dr. Blaisdell, varies in color from pale brown to dark brown, and in length from 5.5 to 6.5 mm.

14. **Hymenorus ulomoides** new species

Elongate oblong, parallel, moderately convex, castaneous, integuments polished throughout, pubescence fine not dense, dull yellow. Eyes (sex doubtful) distant on the front by almost one-fourth more than their own width. Third joint of antennae fully twice as long as the second and one-fourth longer than the fourth, outer joints missing. Head evenly punctate, the punctures less distant than their own diameters.

Prothorax three-fourths wider than long, obtusely rounded in front, as wide at base as the base of the elytra, sides becoming parallel for a short distance at base; punctures slightly finer than on the head, separated by their own diameters as a rule.

Elytra almost four times as long as the thorax and very nearly twice as long as wide; striae closely strongly punctate, feebly impressed on the disk, scarcely so on the apical declivity; intervals finely not closely punctate.

Abdomen finely sparsely punctate, thighs rather stout, basal joint of hind tarsus fully as long as the remainder.

Length, 6.4 mm.; width, 2.5 mm.

Kaweah, California, (Hopping); a single example of unknown sex. Conspicuous by its strongly oblong parallel form which is more than usually obtusely rounded at the extremities.

15. **Hymenorus sinuatus** new species

Closely allied and very similar in appearance to the following species (*macilentus*), the description of which applies sufficiently well except in the following particulars. The form is even a little narrower; the prothorax less transverse, being no more than two-fifths wider than long, as wide at apical two-fifths as at base, the sides perceptibly sinuate before the hind angles; ventral segments more sparsely punctate. The thorax is without discal impressions, but it is not unlikely that these are adventitious in *macilentus*.

Length, 6.8 mm.; width, 2.35 mm.

Described from a single female specimen taken by Mr. J. B. Wallis at Peachland, British Columbia, July 19, 1915, and sent me by Mr. C. A. Frost, who kindly allows me to retain the type. The posterior sinuation of the sides of the thorax is almost a unique character, at least in this section of the genus.

Var. **ebeninus** new variety

A single specimen before me sent by Mr. Dietrich and collected by him in central California resembles very much the type of *sinuatus* and is probably no more than a variant of this species. It differs from the type in having the thorax not at all sinuate on the sides, the pronotal punctuation much coarser and denser, and the antennae and legs entirely black. It bears label "Chiquito Creek, Madera Co., California, 6–27–'20, elev. 4100 ft."

16. **Hymenorus macilentus** new species

Strongly elongate, subparallel, nearly black, legs uniformly brownish red, antennae slightly darker. Surface throughout polished; pubescence very fine, recumbent, brownish fuscous. Antennae short, scarcely two-fifths the length of the body, a little thickened medially; second joint very short, not longer than wide, scarcely half as long as the third, the latter just perceptibly shorter and more slender than the fourth. Eyes separated by about one-fourth more than their own width, front sparsely punctate.

Prothorax transversely oblong with rounded front angles, width three-fifths greater than the length, sides nearly straight and parallel in basal half; surface rather closely somewhat unevenly punctate, the punctures separated by their own diameters medially, sparser toward the base and closer along the side margins; disk biimpressed just behind the middle.

Elytra distinctly wider at base than the thorax and fully four and one-half times as long, fully twice as long as wide, widest just behind the middle. Striae lightly impressed throughout the length, rather finely closely punctate; intervals wide and nearly flat, finely not closely punctate.

Beneath strongly shining, abdomen sparsely finely punctate, last ventral with a somewhat vague apical impression.

Length, 7.7 mm.; width, 2.75 mm.

Described from a single specimen of unknown sex taken by Dr. Fenyes at Pecos, New Mexico, elevation 7200–7500 ft., July 21, 1903.

The narrow form, nearly black color, with red legs, polished surface, fine sparse obscure pubescence and prothorax distinctly narrower than the elytra at base characterize this very distinct species.

17. **Hymenorus atratus** new species

Form elongate, parallel, moderately convex, shining black, not visibly alutaceous; pubescence fine, recumbent, blackish. Antennae stout, median joints moderately obconic, one-half longer than wide. Eyes (♂) prominent, separated by two-thirds their own width.

Prothorax slightly more than one-half wider than long, rounded in front, sides parallel and straight in fully basal half; surface broadly impressed medially, punctures rather fine, separated as a rule by their own diameters or a little more.

Elytra across the humeri nearly one-third wider than the base of the thorax; sides parallel in about basal two-thirds. Striae moderately impressed; interstitial punctures rather coarse, very little finer than those of the striae, about three in the width of an interval.

Propleura coarsely simply punctate, not smoother externally; metasternum finely sparsely punctate medially; ventral segments rather finely, sparsely, evenly punctate; basal joint of hind tarsus as long as the remainder.

Length, 5.9 mm.; width, 2.2 mm.

Described from a single male specimen submitted by the California Academy of Sciences and bearing the following labels. "Chiricahua Mts., Arizona, 8000 ft., July 22, 1927"; "Turkey Flat, Cochise Co.; J. A. Kusche, collector"; Van Dyke collection.

The type is returned to the California Academy collection.

This species is evidently nearly related to *macilenta* in general habitus and notably in the form of the terminal joint of the maxillary palpus. The difference in the width of the front between the eyes in this species and *macilentus* seems altogether too great to permit of specific identity, notwithstanding the difference in sex.

18. **Hymenorus difficilis** Casey

1891. *Hymenorus difficilis* Casey, Ann. N. Y. Acad. Sci., VI, p. 94. (Coleop. Notices, III).

The single specimen under this name in the Casey collection has been labeled "neotype" by Mr. Buchanan. It does not fit the author's description and is evidently not the real thing. The species is quite unknown to me and the diagnostic characters are taken directly from Casey's table. The unique type was said to be a male and was described from New York.

19. **Hymenorus perforatus** Casey

1891. *Hymenorus perforatus* Casey, Ann. N. Y. Acad. Sci., VI, p. 95. (Coleop. Notices, III).

Several years ago I compared a single male example collected by Mr. H. G. Klages at Jeannette in Western Pennsylvania with Casey's type of *perforatus* and judged them to be identical. I have since seen several other similar specimens taken by Mr. Klages in the same locality. The size averages a little larger than in any other species of the group having the third antennal joint shorter than the fourth, and the antennae in the male show rather more distinctly than in the others the slight flaring of the apical angles of the fourth and following joints which produce the subserriform appearance. The prothorax is quite coarsely punctate and perceptibly less wide than the elytral base. In the single female at hand the relative lengths of the third and fourth antennal joints are substantially the same as in the male but the antennae are not at all serriform.

Casey cites as localities Pennsylvania, Indiana, and North Carolina.

20. **Hymenorus obscurus** Say

1826. *Cistela obscura* Say, Jour. Acad. Nat. Sci. Phila., V, p. 242.

The *Cistela obscura* of Say, described in 1826, was the first species referable to the genus *Hymenorus* to be made known from our fauna. The variations in size and color mentioned by Say in his description indicate strongly that his series was not homogeneous and comprised at least two species. Certain it is that his species has never since been definitely known nor will it ever be possible to say from his diagnosis just what he had in hand. Say's statement however that his species is the *Cistela obscura* of the Melsheimer Catalog constitutes a real clue and about the only clue we have to the solution of the problem. It is practically proof positive that *obscurus* is an Eastern Pennsylvania species and points definitely to the Melsheimer collection as the court of last appeal.

Investigation reveals that there is a series of four specimens under the name *obscurus* in the Melsheimer collection, three of

which I regard as slight variants of *pilosus* Melsh., while the fourth is a quite different species having the third antennal joint only about two-thirds as long as the fourth. One of these should be the *obscurus* of Say.

The only other clue to the solution known to me is the presence in the Harris collection of a Massachusetts specimen submitted by Harris to Say and returned by the latter as his *obscurus*. This specimen is quite surely Melsheimer's *pilosus*.

From these two facts it would be not unreasonable to conclude that *obscurus* Say and *pilosus* Melsh. were one and the same species. It should be remembered however that LeConte in 1866 characterizes *obscurus* as notable in having a short third antennal joint in the male. There can hardly be a doubt that his pronouncement is based on this fourth specimen of the Melsheimer series, which was well known to him, and although he doubtless erroneously considered the other Melsheimer examples as females of the same species, still his observation on the antennal character constitutes a choice which I believe should continue to be respected and which avoids the otherwise apparent necessity of sinking Melsheimer's *pilosus* as a synonym.

As above identified *H. obscurus* Say may be characterized as follows.

Size moderate, length between 6 and 7 mm. in all specimens seen, color brown of a shade between ferruginous and piceous, surface polished, pubescence rather long and plentiful. Eyes separated on the front by slightly less than their own width in the male and by fully to more than their own width in the female. Antennae about two-fifths the length of the body, somewhat stout, especially in the female, in which the intermediate joints are more than usually parallel sided and less than twice as long as wide. In the male these joints are about twice as long as wide, less parallel and the outer angles better defined but the antennae are not appreciably serriform. In both sexes the third joint is about two-thirds as long as the fourth. The prothorax is perceptibly less wide than the base of the elytra and is strongly rather coarsely punctate; the punctures separated from a little less to a little more than their own diameters. The elytral striae are distinctly impressed throughout and rather coarsely closely punctate, the interstitial punctures finer and not very numerous but quite strong and distinct.

The antennal characters are chiefly to be depended on in the identification of this species and are best appreciated of course if other species of the small group to which it belongs are present for comparison.

Specimens are known to me from Mt. Airy, Pennsylvania; Wenona, New Jersey; Odenton, Maryland; Boykins, Virginia. The species seems to be scarce and here as in all other species of the restricted group far too few examples have been seen to judge of the extent of individual variation. I am especially indebted to Mr. Liebeck, who has sent the greater number of specimens before me.

Before passing it may be well to say that the *obscurus* of the LeConte collection is not that of the Melsheimer collection and therefore not Say's species as here interpreted. There are two examples under the name *obscurus* in the LeConte cabinet, both bearing orange disk locality labels, indicating that they are from the Southern States. The first specimen, on the name label, supposed by LeConte to be the female (it may or may not be of this sex) is apparently Casey's *obesus*. The second example is a male, and having the third antennal joint short was assumed to be *obscurus;* it is however a different though closely allied species and is probably that described under the name *illusus* in the present paper.

An examination of the Casey collection shows that he too was equally at fault in interpreting this species. His supposed male (Texas) I have proved by dissection to be a female. It certainly is not Say's species, but may be my *illusus*, though of this I cannot speak with certainty. His supposed females are Melsheimer's *pilosus*, sex not evident.

21. **Hymenorus illusus** new species

Rather broadly oblong-oval, piceous brown, shining, luteo-pubescent. Antennae subequal to half the length of the body, perceptibly serriform from the fourth joint, the outer angle of which is slightly flaring; intermediate joints about twice as long as wide and moderately obconic, third joint one-half as long as the fourth. Eyes (♂ type) separated by their own width.

Prothorax slightly more than two-fifths wider than long, perceptibly less wide than the base of the elytra, sides converging feebly then more strongly almost from the base, not at all

expanded and incurved basally; surface nearly evenly rather coarsely punctate, the punctures distant on the average by a little more than their own diameters.

Elytra seven-tenths longer than wide and three and one-fifth times as long as the prothorax; striae distinctly impressed, closely strongly punctate; interspaces more finely and sparsely punctate, the punctures showing a tendency toward a biserial arrangement on some of the intervals.

Beneath moderately coarsely and sparsely punctate as in the allied species.

Length, 5.8 mm. (head deflexed); width, 2.5 mm.

Mobile, Alabama; type male, bearing date, IV–12–'08, and taken "in fungi" by Mr. Löding, to whom I am indebted for the privilege of retaining the specimen.

That the male of the supposed pair of *obscurus* in the LeConte collection is the same as the present species is indicated in the remarks under *obscurus;* more material is needed however before a conclusion can be reached. It is probable that *illusus* is confined to the Southern States.

22. **Hymenorus curticollis** Casey

1891. *Hymenorus curticollis* Casey, Ann. N. Y. Acad. Sci., VI, p. 95. (Coleop. Notices, III).

The somewhat narrower form, slightly shorter thorax with greater basal width, and the slightly shorter third antennal joint, should serve to distinguish the present species from the preceding, the one with which it is most likely to be confused.

Casey's type series of three specimens is from Iowa. After seeing the type I have confidently placed as equivalent a male from Hope, Arkansas, in my collection and have later annexed two examples (♂, ♀) from Jeannette, Pennsylvania. Casey claims to have both sexes in his series and I think correctly so, but instead of his supposed female having the third and fourth antennal joints subequal, as his statements lead one to expect, I find the third joint very distinctly shorter than the fourth though to a less degree than in the male, and very much as in my Jeannette female. In describing the thorax of this species as four-fifths wider than long Casey is materially in error, as a measurement of the type by Mr. Buchanan shows the width to be only three-fifths greater than the length.

23. **Hymenorus communis** LeConte

1866. *Hymenorus communis* LeConte, Smiths. Misc. Coll., VI, No. 167, p. 135. (New Species of N. Am. Col., pt. I, 2d Ed.).

This little species was described by LeConte in 1866 as "not rare in the Middle and Southern States." The type on the name label in the LeConte collection, and also one other example without head and thorax, are both males and bear pink disk locality labels indicating Middle States region (probably Pennsylvania). In the type the third antennal joint is short, barely half the length of the fourth, and this fact is noted by LeConte. His supposed females with third and fourth antennal joints subequal bear orange disk labels (Southern States), and while superficially similar to the males in general form, size and color, they represent a very distinct species which I have described on a preceding page under the name *distinctus*.

The true *communis* seems to be a decidedly rare species, and I have seen only three other specimens that I could confidently refer there. These were included in the *obscurus* series in the National Museum collection and bear the State label "N. Y." without more precise indication of locality.

24. **Hymenorus bitumescens** new species

Very elongate, dark brown, luster dull, thinly fulvous pubescent. Antennae not quite half as long as the body, slender, feebly serriform, intermediate joints fully twice as long as wide. Eyes (♂) very approximate, separated by rather less than the width of the second antennal joint.

Prothorax unusually elongate, less than one-fifth wider than long, less rapidly narrowed in front than usual, sides parallel and nearly straight in basal third, disk not distinctly impressed, rather densely finely punctate, the punctures distant by less than their own diameters.

Elytra at base slightly wider, and at middle one-fifth wider than the thorax, nearly parallel sided; striae fine, lightly impressed, interstitial punctures numerous, three as a rule in the width of the interval; sutural angles feebly sinuate externally and slightly prominent.

Propleura sparsely punctate externally; ventral segments finely nearly evenly punctate. On the hind margin of the protibiae there are two swellings, one at the extreme base on the inner side, the other above the middle and more external; the comb of the protarsal claw in the male has twenty or more teeth.

Length, 8.5 mm.; width, 2.7 mm.

Described from a single male specimen from Tucson, Arizona, VIII–6, submitted by Mr. Liebeck. With the type is doubtfully associated a female specimen also from Mr. Liebeck and bearing labels "Tucson, Ariz." and "Sabinol Can., Santa Catalina, V–14–19," this latter now in Mr. Liebeck's collection.

This species is closely related to *spinifer* Horn, agreeing nearly with the latter in form, antennae, closely approximate eyes and very numerous teeth of the ungual pectination. In the male of *spinifer* there is a single swelling on the postero-external margin of the protibia, but it is more median in position, and the sutural angle of the elytra is typically acuminate and produced; scarcely at all so in the present species. It should be remarked however that the spiniform sutural process varies individually in *spinifer*, being much less developed in some examples. The pronotal punctuation is distinctly coarser in spinifer than in the present species.[2]

25. **Hymenorus spinifer** Horn

1894. *Hymenorus spinifer* Horn, Proc. Cal. Acad. Sci., ser. 2, IV, p. 434. (The Coleop. of Baja Cal.).

Horn characterizes this species as the largest known in the genus and gives the length as 9.5 to 12 mm. In my series there is a dwarf male measuring only 6.9 mm., the greater number of specimens ranging in length from 9 to 10 mm. The chief characteristic of the species is the acute prolongation of the sutural angle, in which respect it is nearly unique in our fauna, *bitumescens* and *irritus* alone showing a similar structure but in less developed form. This prolongation varies a good deal individually in development in *spinifer*, ranging from merely an acute angle to a distinct spine. In the other two species mentioned there is a slight sinuation before the sutural angle which becomes in consequence a little prominent.

It is a little singular that Horn observed neither the prominent swelling on the inner margin of the front tibia nor the dilation of the hind tibia in the male of this species, unless perchance his specimens were all females. This type of secondary sexual modification of the protibia occurs in several other species but

[2] Since writing the above I have seen a single male from Florence, Arizona, in the Cornell University collection.

is nowhere so strongly marked as here. It was entirely overlooked by Casey.

Horn's type series was from Southern Arizona, from which region come all the examples seen by me. The following specific localities are represented in the material at hand: Oracle; Globe; Ajo; Fresnal Canyon, 2500 ft., March to June, Baboquivari Mountains.

26. **Hymenorus protibialis** new species

Moderately elongate, subparallel, piceous brown above; antennae, legs and body beneath ferruginous, luster rather dull; pubescence thin, short, recumbent, fulvous. Antennae two-fifths as long as the body, slender, third joint slightly longer than the fourth, intermediate joints a little more than twice as long as wide, just perceptibly obconic, the outer joints with a very slight sinuation beneath making them feebly subserriform. Head closely punctate; eyes large, separated on the front by less than the width of the second antennal joint in the male, and by about the width of this joint in the female.

Prothorax seven-tenths to eight-tenths as long as wide, sides parallel basally, gradually arcuately narrowed in front and rounding into the apex; surface densely rather finely punctate, the punctures not in actual contact; disk flatly convex, median line vaguely or scarcely impressed posteriorly, hind angles right.

Elytra slightly more than twice as long as wide, at base just perceptibly, at middle one-fifth wider than the base of the thorax; striae fine, feebly impressed on the disk, more distinctly so laterally; intervals finely not densely submuricately punctate.

Propleura sparsely punctate toward the side margin, becoming nearly smooth behind. Ventral segments one to three nearly uniformly punctate, only a little more closely so medially. Thighs rather stout, the front ones nearly straight beneath in outline; basal joint of hind tarsus slightly longer than the remainder.

Length, 7.25–8.2 mm.; width, 2.7–2.85 mm.

Described from 2♂, 2♀, Indio, Southern California. Type, male. I have also seen a specimen from Dome, Arizona, in the collection of the California Academy.

The comb of a protarsal claw has about twenty-four teeth in the male, and ten in the female. In the male the protibiae have a small obtuse prominence above the middle posteriorly.

27. **Hymenorus cassus** new species

Closely allied to the preceding species (*protibialis*), the description of which serves sufficiently well except in the following particulars. The eyes are a little less approximate, being separated by the width of the second antennal joint in the male and by nearly twice the width of this joint (about one-third the width of the eye) in the female. The prothorax is a little more strongly transverse, the sides parallel for a longer distance posteriorly (about basal half) and hence more obtusely outlined in front; punctuation evidently coarser than in *protibialis*. The front tibiae show an incipient dilatation in the same position as in *protibialis*, which however may easily be overlooked, as it is scarcely visible except from a certain viewpoint. Basal joint of hind tarsus very distinctly longer than the remainder. Form slightly stouter and more oblong than in *protibialis*.

Length, 7.4–8 mm.; width, 2.8–2.9 mm.

Described from three examples (1♂, 2♀) from Santa Rosa, Lower California, collected by the late Mr. Gustav Beyer. The male is taken as the type.

This species is one of several of the *grandicollis* type which though probably mutually distinct are so closely allied as to render discrimination rather difficult, especially if males are lacking. In *cassus* the outer margin of the propleura becomes rather abruptly narrowly smooth and subhorizontal in a way which is absent or but faintly indicated in *grandicollis* and other closely allied species.

28. **Hymenorus grandicollis** Champion

1888. *Hymenorus grandicollis* Champion, Biol. Cent.-Amer., Coleopt., IV, pt. I, p. 429.

My conception of this species is based on two examples from Arizona kindly sent me for examination by Mr. K. C. Blair of the British Museum. One of these is a female from the Biologia material and bears a name label in Casey's handwriting and also Champion's initials "G. C. C." The other example is a male from the Sharp collection, collected by Morrison and identified by Mr. Blair from comparison with type. The two examples of *grandicollis* in the Casey collection seem to me to be quite surely identical with the above, as do other specimens from Tucson, Arizona, sent me by Mr. Liebeck. Several females in my collection from the Baboquivari Mountains, Arizona, are for

the present referred here, though a little more robust and with slightly coarser punctuation.

Although Casey remarks that both of his specimens are males, I find the one on the name label to be a female with ten teeth in the protarsal pectination. His second example is a male with about sixteen to eighteen teeth in the protarsal comb. Mr. Blair writes me that the type of the species is a female and has ten teeth on the protarsal claw.

29. **Hymenorus porosicornis** Casey

1891. *Hymenorus porosicornis* Casey, Ann. N. Y. Acad. Sci., VI, p. 101. (Coleop. Notices, III).

This species differs from all others having similar modification of the male protibiae by the wider and polished sparsely punctate interocular space. According to Casey the eyes are separated in the male of *porosicornis* by one-fifth and in the female by two-fifths their width, but measurements made by Mr. Buchanan show that in Casey's male type the distance apart is one-third, and in one of the females of the series is .45 of the ocular width. In each of the three females in my own collection the distance apart is even somewhat more than half the width of the eye. In *porosicornis* the antennae are slightly thicker than in *grandicollis* and very distinctly so as compared with the preceding species.

This species seems not to be rare in the vicinity of El Paso, Texas, and in Southern New Mexico. The type series is from El Paso; other localities known to me are Silver City (J. B. Wallis), Mesquite near Mesilla Park, and "10 miles E. of Deming" [Cornell Univ. Coll.], all in New Mexico.

30. **Hymenorus helvinus** Casey

1891. *Hymenorus helvinus* Casey, Ann. N. Y. Acad. Sci., VI, p. 101. (Coleop. Notices, III).

The few specimens seen of this species are from Texas, doubtless from the western portion of the State. A specimen in my own collection from Alpine, Texas, collected by Poling, alone carries a precise locality.

The tibial swelling of the male is rather near the base and though not very strong is plain enough when viewed from the right angle.

The smaller size and paler color combined with the other tabular characters should be sufficient for its recognition if males are at hand.

31. **Hymenorus irritus** new species

A moderately large to large species of the *protibialis*, *cassus*, *grandicollis* type, and so closely similar in general aspect to these species that it seems only necessary to give the distinctive characters, two of which are of primary importance. These are the tabular characters—protibia of male without any definite trace of a swelling on the postero-interior margin, and sutural angle slightly prominent with a feeble sinuation each side. The size is on the average a little larger than in any of the species above mentioned, the color varies from ferruginous brown to piceous, the luster dull, the pubescence short, recumbent, dull luteous in color. The eyes as a rule are separated by a distance about equal to the width of the third antennal joint, with little or no obvious sexual difference in this respect, though some small individual variation exists. The number of teeth in the protarsal pectination is about twenty-four in the male and eleven or twelve in the female.

Length, 7 to 9.2 mm.

Described from a series of eighteen specimens; the type (♂) and ten other examples from Indio, California, (collected by F. Stickney). Other localities represented either in my own or other collections are La Puerta Valley and Alpine in San Diego County; Mecca, Calipatria and Coachella, Riverside and Imperial Counties; Yuma and Welton, Arizona.

32. **Hymenorus conformis** new species

Oblong-oval, moderately convex above, fuscous brown, integuments finely alutaceous and dull; beneath castaneous, last two ventral segments usually darker, legs and antennae paler; pubescence dull yellow, subrecumbent.

Head moderately closely punctate; eyes separated by scarcely more than the maximum width of the third antennal joint, or by about one-third their own width, the distance varying but slightly in the sexes. Antennae not quite half the length of the body, third joint just visibly longer than the fourth, intermediate joints slightly obconic and not quite twice as long as wide.

Prothorax two-fifths wider than long, sides gradually rounding into the apex, becoming parallel and straight in about the basal fourth; surface finely densely evenly punctate, the punctures not quite in contact.

Elytra at base subequal to, and at middle about one-sixth wider than the thorax, not quite twice as long as wide; striae very feebly impressed, strial punctures fine, but little larger than those of the intervals, the latter moderately numerous with three to four in the width of the interspace.

Propleura more sparsely punctured externally; ventral segments one to three sparsely finely punctate, finely alutaceous and moderately shining; basal joint of hind tarsus subequal to the remainder; comb of protarsal claw with about twelve or fourteen teeth in the male and about eight in the female.

Length, 6.3–7.2 mm.; width, 2.35–2.7 mm.

Alpine, Texas, July 1–15, (O. C. Poling). Described from a series of eight specimens (2♂, 6♀), in part contributed by Mr. Henry Dietrich. The type is a male. In this sex I note a secondary sexual character which is quite unique among our species. This consists of two small longitudinal erosions, one on each side of the median line of the metasternum posteriorly, and may easily be entirely concealed in the mounting. Aside from this peculiar sexual character the species is of a common type without any marked individuality.

33. **Hymenorus vigilax** new species

Elongate oblong-oval, brown, body beneath, legs and antennae a little paler and more rufo-ferruginous; pubescence moderate, inclined, fulvous; surface scarcely shining.

Head densely punctate, eyes (♂) large, separated on the front by a distance equal to the width of the second antennal joint. Antennae slender, two-fifths the length of the body, median joints feebly obconic and rather more than twice as long as wide.

Prothorax one-half wider than long, obtusely rounded in front, sides becoming parallel for a very short distance at base; surface with rather coarse shallow punctures which are in contact or very nearly so throughout.

Elytra slightly but quite distinctly wider at base than the thorax, sides subparallel in more than basal half; sutural angle narrowly rounded as usual; striae finely impressed and finely punctate; interstitial punctures fine and rather sparse, there being only two or rarely three in the width of the interval.

Propleura closely punctate along the prosternal sutures, elsewhere sparsely punctate and strigose; metasternum sparsely not very coarsely punctate laterally, more finely but not densely so medially; ventral segments moderately nearly evenly punctate;

basal joint of hind tarsus subequal in length to the remainder; protarsal claw (♂) with about sixteen teeth.

Length, 6.8 mm.; width, 2.5 mm.

Prescott, Arizona, VII–12–1917, (C. A. Hill Coll.). A single male specimen from the collection of the California Academy, to which the type is returned.

This species may stand between *irritus* and *conformis* to which it is related by its narrowly separated eyes and sparse propleural punctuation. It differs from the former by its rather smaller size and narrower form, relatively narrow thorax, simply rounded sutural angles and much less numerous teeth of the protarsal pectination. As compared with *conformis* the antennae are a little more slender, the thorax smaller and more coarsely punctate and the metasternum shows no trace of the longitudinal erosions present in the male of that species.

34. **Hymenorus papagonis** new species

Elongate oblong-oval, dark brown above, antennae, legs and under surface a little paler and rufescent; luster dull; pubescence rather plentiful, subrecumbent, fulvous. Antennae rather stout, less than two-fifths as long as the entire body, not at all serriform, third joint just visibly longer than the fourth, intermediate joints obconic, less than twice as long as wide. Eyes separated in the male by one-fourth to one-third their own width, or by the width of the third or fourth antennal joint, scarcely more distant in the female.

Prothorax one-third wider than long, sides either parallel basally for about two-fifths their length or just perceptibly divergent at base; punctuation rather coarse and extremely dense.

Elytra two and four-fifths times as long as the thorax and at base only very slightly wider than the latter; sides parallel and almost straight in basal two-thirds; striae and punctuation moderate, surface feebly shining.

Propleura not smoother externally and only narrowly so at the hind margin; ventral segments moderately shining, first to third with median areas of dense finer punctures in the male. In the female these segments are distinctly more closely punctate medially than at sides but have not the small areas of finer denser punctures present in the male. As usual the last two segments are much more sparsely punctate, and may be either concolorous or blackish.

Length, 6–7.8 mm.; width, 2.2–2.7 mm.

Baboquivari Mountains, Southern Arizona. Type, male. Ajo, Pima County; Pinal Mountains, both Southern Arizona. Eleven specimens are before me, the greater number from the first named locality, all collected by O. C. Poling.

By the character of the ventral punctuation in the male this species is most nearly related to *apacheanus* Csy., but differs therefrom by its much more coarsely punctate thorax, and its less densely punctate and less dull elytra. In the only male specimen of *apacheanus* at hand the comb of the protarsal claw has about sixteen teeth; in *papagonis* the number is thirteen or fourteen in the male and about eight in the female.

I have also seen additional specimens of this species from the following Arizona localities: Sabino Cañon near Tucson, [Liebeck]; Globe, Gillespie's Dam and Oracle, [California Academy Coll.].

35. **Hymenorus apacheanus** Casey

1891. *Hymenorus apacheanus* Casey, Ann. N. Y. Acad. Sci., VI, p. 99. (Coleop. Notices, III).

Casey's unique type of this species is a large female measuring 8 mm. in length. Because of the comparatively dense punctuation of the median parts of the first three ventral segments Casey not unnaturally supposed his type to be a male; however in *apacheanus* as well as in the closely allied *papagonis* both sexes show this denser ventral punctuation about equally, at least as far as the first segment is concerned, the second and third in some females of the present species being noticeably less densely punctate than in the male. The rather large size and stoutish form, blackish brown color, densely sculptured and dull integuments, simple male protibiae, propleura not smoother externally, eyes separated in male by about one-third and in female by two-fifths to three-fifths their own width, characterize this species.

The few specimens before me range from 6.7 to 7.25 mm. in length (head deflexed), and from 2.75 to 3.1 mm. in width.

ARIZONA: Chiricahua Mountains; Paradise, [Liebeck Coll.]. Texas Pass, [Cornell Univ. Coll.]. CALIFORNIA: Calipatria, (Benedict), [Kansas Univ. Coll.]. Casey's type is said to be from Arizona without mention of specific locality.

36. **Hymenorus parvus** new species

Very small, oblong-oval, moderately convex, dark brown, legs and antennae brighter ferruginous; prothorax dull, elytra feebly shining, luteo-pubescent. Antennae short, scarcely two-fifths as long as the body, intermediate joints feebly obconic, about one-third longer than wide. Eyes distant on the front by scarcely more than one-third their own width in the male, the female differing but slightly in this respect.

Prothorax nearly as wide at base as the base of the elytra, about one-third wider than long, sides rather strongly arcuate, becoming subparallel for a short distance basally, surface very densely punctate throughout.

Elytra slightly oval, the sides broadly but perceptibly arcuate to base, widest just before the middle; striae fine, moderately punctate; intervals more finely but distinctly and rather sparsely punctate.

Propleura not smoother exteriorly; first two ventral segments of the male not perceptibly more finely and densely punctate at middle; basal joint of hind tarsus equal in length to the remainder; comb of protarsal claw with about twelve or thirteen teeth in the male and eight in the female.

Length, 4.6 to 5 mm.; width, 1.8 to 2.1 mm.

Santa Rosa, Lower California, (Beyer). Six examples; type, male. Three examples from San Diego [Blaisdell Coll.] appear to be identical with the Lower California type series except for somewhat larger average size.

This little species looks rather out of place in its present position, and but for its more approximate eyes would be placed next to *confertus*, to which it seems otherwise most closely related. In *confertus* the sides of the thorax are parallel basally for a greater distance, the elytra are more parallel sided basally, the sculpture in general a little coarser, and the first two ventrals of the male show more or less feeble traces of groups of finer punctures at middle.

37. **Hymenorus semirufus** new species

Narrowly oblong-oval; head, thorax, base of elytra and body beneath rufous, legs and antennae concolorous or somewhat paler; integuments moderately shining, the pronotum minutely alutaceous.

Antennae nearly one-half the length of the body, rather slender, the median joints nearly twice as long as wide. Eyes separated in the male by one-fourth to one-half and in the female by about two-fifths their own width.

Prothorax one-third wider than long, a little more transverse in the female, sides divergent throughout, not at all rounded in at base; surface densely coarsely punctate, the punctures everywhere almost in contact. Elytral striae finely impressed, strial punctures moderate, intervals sparsely more finely punctured.

Body beneath nearly as in *dorsalis;* comb of protarsal claw with about twenty-three teeth in the male and thirteen in the female.

Length, 4.2 to 5.25 mm. (6.25 mm. in one very large female).

Dunedin, Florida. Five examples sent me by Mr. Blatchley as his interpretation of *dorsalis*. Holotype (♂), bearing date, "4–3–1913," and allotype (♀), "4–1–21," are in my own collection; paratypes in Mr. Blatchley's collection.

This species possesses the typical coloration of *dorsalis*, but is smaller and narrower, the thorax more densely punctate and without the slight basal inflation of the sides characteristic of that species. It is extremely close to *caducus* in almost all respects and I at first regarded the two forms as color phases of a single species; the very numerous teeth of the pectination of the protarsal claw in the male however distinguish *semirufus* sharply not only from *caducus* but also from every other species occurring in the Eastern United States, and only a small number of species from our extreme Southwestern region are comparable with it in this respect.

38. **Hymenorus occidentalis** Champion

1888. *Hymenorus occidentalis* Champion, Biol. Cent.-Amer., Coleopt., IV, pt. I, p. 425.

Two examples from the Biologia material, one from Texas, the other from Mexico, have been sent me for examination by Mr. Blair of the British Museum. The specimens under this name in the Casey collection and one sent me for study by Mr. Liebeck are in every way identical with the above. The species should be recognized at once by its very large size (10–11 mm.) and coarsely very densely punctate thorax. It is equalled in size only by the larger examples of *spinifer*, in which species the form is less robust, the pronotum less coarsely punctate and the pro- and metatibiae show secondary sexual modifications in the male.

All specimens of *occidentalis* seen from within our faunal limits are from Texas.

39. **Hymenorus capensis** new species

Elongate oblong-oval, blackish brown above, legs, antennae and body beneath castaneous, luster dull; pubescence sparse, short, fine, recumbent, subfuscous.

Antennae (♂) rather slender, two-fifths as long as the body, joints elongate obconic, third joint one-third longer than the fourth, intermediate ones twice as long as wide. Eyes separated by about two-fifths their own width, or by a little less than twice the width of the third antennal joint.

Prothorax one-third wider than long, not quite as wide as the elytra at base, sides moderately strongly arcuate in front, very feebly so behind and barely perceptibly incurved basally, the hind angles right; surface flatly convex, not distinctly impressed medially, punctuation rather coarse and very dense.

Elytra about three and six-tenths times as long as the thorax, striae feebly impressed, finely punctate; intervals with fine rather distant confused punctures.

Propleura narrowly smoother externally; ventral segments shining, sparsely finely nearly uniformly punctate; protibiae of male not modified; comb of protarsal claw with about eighteen teeth.

Length, 8.8 mm.; width, 3 mm.

Described from a single male collected by the late Gustav Beyer at El Taste, in the Cape region of Lower California.

This species would follow *occidentalis* in Casey's table. The latter is nearly allied but is a much larger species, hitherto reported only from Texas in our fauna.

40. **Hymenorus prolixus** Casey

1891. *Hymenorus prolixus* Casey, Ann. N. Y. Acad. Sci., VI, p. 103. (Coleop. Notices, III).

This is one of our larger species with a length ranging from 8 to 10 mm., but ordinarily around 9 mm. The width of the front between the eyes shows somewhat more than the usual amount of sexual variation, being in the male from rather less than two-fifths to quite one-half the width of the eye, and in the female nearly or quite four-fifths the ocular width. If males are present the unmodified protibiae combined with the very numerous pectinations of the protarsal claws associate this species with but few others, from which the tabular characters should suffice to differentiate it readily, with the possible exception of *capensis*, in which case the locality label would probably be decisive.

Casey's type series consists of two Arizona specimens, male (type) and female (the latter marked "♂"), and two from New Mexico, both females.

The following definite localities are known to me: TEXAS: Alpine. NEW MEXICO: Jemez Springs; Fort Wingate; Silver City. ARIZONA: Chiricahua Mountains; Baboquivari Mountains; White Mountains, Gila County; Fort Apache; Paradise. UTAH: St. George.

41. **Hymenorus jacobinus** new species

Oblong-oval, moderately elongate, dark brownish ferruginous, antennae, legs and inferior surface a little paler; pubescence fine, recumbent, not dense, fulvous; luster above dull, beneath shining.

Antennae about two-fifths as long as the body, joints elongate obconic, feebly subserrate, third only just visibly longer than the fourth, intermediate joints nearly twice as long as wide. Eyes separated by about two-fifths their own width, and not appreciably differing in the sexes.

Prothorax at base subequal in width to the base of the elytra, about one-half wider than long, sides becoming parallel for a short distance at base, the basal angles right; surface densely finely punctate, vaguely impressed along the median line.

Elytra nearly four times as long as the prothorax and twice as long as wide, sides parallel; striae fine, scarcely impressed on the disk, a little more so laterally; intervals sparsely finely punctate.

Propleura smoother at sides and rear; ventral segments sparsely punctate at sides, the first three more closely so at middle; legs not sexually modified; comb of protarsal claw with about twenty teeth in the male and ten or twelve in the female.

Length (♂), 7.8 mm.; width, 2.8 mm.

Described from a single pair (♂, ♀) taken at or near San Diego, California. Type, male; the female bears date, IX–3–11; it is slightly larger than the dimensions given above.

This species greatly resembles *irritus* described above, but may be distinguished at once by the more distant eyes and the simply rounded sutural angles.

42. **Hymenorus digressus** new species

Narrowly oblong-oval, dark brown above, antennae, legs and body beneath reddish brown, the abdomen becoming blackish at apex; body above finely alutaceous and dull, pubescence short, inconspicuous, pale fulvous.

Antennae a little less than half the length of the body, not at all serriform, third joint slightly longer than the fourth, median joints moderately obconic, not quite twice as long as wide. Head closely punctate behind, front and vertex loosely so; eyes in both sexes separated by two-fifths their own width or a little less.

Prothorax not quite one-third wider than long, sides broadly arcuately convergent in front, subparallel for a short distance at base, hind angles rectangular; surface densely, evenly, moderately coarsely punctate, the punctures as is often the case with abrupt anterior walls but open posteriorly.

Elytra evidently wider at base than the thorax, the humeri perceptibly exposed, two and one-half times as long and at middle about three-tenths wider than the thorax; striae finely impressed and moderately punctate, interspaces finely rather sparsely punctate.

Propleura nearly smooth toward the outer and rear margins; ventral segments finely sparsely punctate, scarcely more closely so at middle; basal joint of hind tarsus distinctly longer than the remainder. The comb of the protarsal claw in the male has seemingly about twenty teeth but they are very difficult to count; in the female the number is about eight.

Length, 5–5.5 mm.; width, 1.8–2.1 mm.

Baboquivari Mountains, Southern Arizona; three examples (1♂, 2♀). Collected by O. C. Poling, Oct. 1923. The male is taken as the type. In this male the hind tibiae are slightly compressed and dilated in the apical half, and it is probable that this character will prove constant.

The large number of teeth in the protarsal pectination of the male is unusual for so small a species.

43. **Hymenorus montivagus** new species

Elongate oval, reddish brown to piceous brown, prothorax dull, elytra feebly shining, pubescence fulvous, recumbent, not dense. Antennae rather slender, median joints fully twice as long as wide. Eyes separated by from slightly less than half to fully half their own width.

Prothorax seven-tenths as long as wide, widest at extreme base where however the sides become nearly parallel, base angles rectangular; surface densely punctate, the punctures moderate in size, not quite in contact at the middle of the disk but nearly so elsewhere.

Elytra at base slightly wider than the thorax and a little more than three times as long, twice as long as wide, sides feebly

arcuate; striae fine, lightly impressed; intervals finely not densely punctate.

Propleura not smoother at sides. Ventral segments shining, the first three a little more closely punctate at the middle, at least in the male. Protarsal claw of male with about twelve teeth.

Length, 7.3–8.7 mm.; width, 2.5–2.9 mm.

Echo Mountain, Los Angeles County, California, (4 specimens); San Diego County, California, (1 specimen).

The type is a male from the first named locality.

44. **Hymenorus inutilis** new species

Extremely similar to the preceding species (*montivagus*), the description of which will serve sufficiently well except as to the antennae, which in the present species are appreciably shorter, stouter, and more serriform, the median joints plainly less than twice as long as wide. The eyes in the male are separated by about two-fifths their own width. The prothorax is as densely punctate as in *montivagus*, but the sides are almost perfectly straight in the posterior half and are divergent throughout. The first three ventral segments are only slightly more punctate at middle. There are about twelve teeth in the comb of the protarsal claw.

Length, 7.8 mm.; width, 3 mm.

Described from a male specimen from Las Vegas, Nevada, (Tom Spaulding collector).

With the type I place confidently a male and female from Eureka, Utah, also collected by Spaulding. These agree well in size, form and sculpture with the type, except that the eyes are separated by somewhat more than half their own width and are slightly more distant in one than in the other. In the male there are about twelve or thirteen teeth in the comb of the protarsal claw and in the female eight.

More recently I have seen specimens from Silver City, New Mexico, (J. B. Wallis), and Santa Rita Mountains, Arizona, [Snow Collection], which seem to belong here.

45. **Hymenorus planulus** Horn

1894. *Hymenorus planulus* Horn, Proc. Cal. Acad. Sci., ser. 2, IV, p. 434. (Coleop. of Baja Cal.).

This species was described by Horn in 1894 in his paper on the Coleoptera of Baja California from a single female taken at El Taste. The unique type was returned to the California

Academy and some time later Horn received from Chas. Fuchs a second specimen bearing label San Lozaro, which now represents the species in the Horn cabinet, and which in every respect agrees with a specimen in my own collection from the same locality given me by Mr. Fuchs at about the same time. Aside from the type these two examples are the only ones known to me in collections.

My own specimen is a female 7 mm. long (type 7.5 mm.) and is a dark brown very densely punctate insect with strongly alutaceous elytral intervals which are muricately punctate and perfectly dull in luster. The eyes are separated on the front by three-fifths their own width and the sides of the thorax are straight and parallel in almost the basal half. These characters together with the relatively smooth propleura are those of chief diagnostic value, and aided by the locality will probably enable the species to be recognized.

46. **Hymenorus nitidipennis** Casey

1891. *Hymenorus nitidipennis* Casey, Ann. N. Y. Acad. Sci., VI, p. 113. (Coleop. Notices, III).

Elongate oblong-oval, parallel, dark brown, legs and antennae ferruginous. Eyes separated in the male by about one-half, and in the female by three-fourths their own width. Antennae half as long as the body, rather stout, compact, filiform, the intermediate joints fully twice as long as wide and only slightly obconic. Prothorax perceptibly narrower at base than the base of the elytra, very densely punctate, elytra finely alutaceous but somewhat shining. Propleura not smoother externally; metasternum more coarsely and sparsely punctured at middle than usual. Comb of protarsal claw with about ten teeth in the male and six in the female.

Length, 6.5 to 6.8 mm.; width, 2.3 to 2.35 mm.

Casey's unique type is a female and is described from Arizona. The single example in my collection is a male from the Santa Rita Mountains, Arizona.

The long yet somewhat stout antennae with intermediate joints nearly parallel sided, and the relatively coarsely punctate median area of the metasternum, are valuable diagnostic characters in this species.

47. Hymenorus discrepans Casey

1891. *Hymenorus discrepans* Casey, Ann. N. Y. Acad. Sci., VI, p. 98. (Coleop. Notices, III).

This small species (length, 5.5 mm.) is known to me only by the unique type from California in the Casey collection. The species is notable for the "extremely densely crowded punctuation of the pronotum and correspondingly sparse elytral punctures." The elytra are said to be polished, which does not at all apply to either of the two following species, in both of which the antennae are distinctly stouter. For further points consult Casey's very good description.

48. Hymenorus exiguus Casey

1891. *Hymenorus exiguus* Casey, Ann. N. Y. Acad. Sci., VI, p. 100. (Coleop. Notices, III).

Size small (3.5 to 5 mm.), color varying from castaneous brown (typical) to pale flavate; upper surface finely densely punctate and dull, pubescence pale, short, dense and conspicuous. Eyes separated by two-fifths to one-half their width in the male and in the female from rather less than two-fifths to fully three-fourths their width. The females show exceptional variability in this respect, so that in some individuals of this sex the eyes are actually more approximate than in the average male. The densely punctulate and pubescent areas at middle of first three ventral segments in the male constitute a valuable diagnostic character in this species. A similar structure though less distinct has been alluded to under *papagonis* and also occurs in *trivialis* (first segment only), *punctatissimus* (first two segments) and *thoracicus* (first three segments).

Casey's unique type (♀) was described from El Paso, Texas. I have seen numerous examples from various points in Arizona: Tucson, Phoenix, Florence, Magna, Gila Bend, Roosevelt, and others from La Puerta Valley and Palm Springs in Southern California. A series from the last named locality sent me by Mr. A. C. Davis of Santa Ana, California, is notable for the very pale flavate color of all the specimens. This is probably due in some degree at least to immaturity.

49. Hymenorus trivialis new species

Closely allied to *parvus* but smaller and narrower, the thorax more elongate, the form less convex, the antennae stouter and

perceptibly attenuate apically, the median joints only very slightly longer than wide. The eyes are separated in the male by rather less than two-fifths and in the female by about one-half their own width. The basal ventral segment of the male has a patch of fine punctures at middle but the second segment does not show this noticeably, though in both sexes the abdomen is more finely and closely punctured at middle than at sides. The basal joint of the hind tarsus is equal in length to the remainder and the comb of the protarsal claw has as in the preceding species about ten teeth in the male and eight in the female.

Length, 3.75–4.6 mm.; width, 1.6–1.85 mm.

Santa Rosa, Lower California, (Beyer). Eight examples; type, male.

This species also resembles Casey's *macer*, which is itself not separable from LeConte's *punctatissimus*, agreeing with it very closely in general outline and in the form of the antennae, but is smaller, a little more depressed, with less distant eyes, less fine strial punctures and less numerous interstitial punctures. In females of *macer* the protarsal comb seems to consist of only about six teeth.

50. **Hymenorus fuscipennis** new species

Narrowly elongate-oval, moderately convex; head and prothorax rufous, elytra piceous brown, body beneath rufous becoming piceous toward the ventral apex, legs and antennae rufotestaceous; integuments minutely alutaceous, slightly shining; pubescence rather long, subrecumbent, luteous.

Head coarsely punctate; eyes (♂) large, separated on the front by about three-eighths their own width. Antennae rather stout, perceptibly longer than half the body, intermediate joints moderately obconic and about twice as long as wide.

Prothorax more elongate than usual, scarcely more than one-third wider than long, sides almost straight and convergent from base to apical third, apical angles obtuse but evident; punctures moderate, close set but not in actual contact, a short impunctate line at middle; disk with a vague but shallow rounded impression anteriorly and a more distinct one before the base.

Elytra a little more than three times as long as the thorax, at base just perceptibly wider and at middle fully three-fifths wider than the latter; striae lightly impressed toward the suture and sides, scarcely impressed medially, punctures of striae and intervals nearly equal in size.

Propleura not smoother externally; ventral segments in the male without trace of more densely punctate and pubescent areas; basal joint of hind tarsus distinctly shorter than the remaining joints; comb of protarsal claw with about eight teeth.

Length, 4.6 mm.; width, 1.5 mm.

Described from a single male specimen labeled Miami, Florida, and kindly given me by Mr. Henry G. Klages.

This little species is readily separated by the tabular characters from the associated species. Superficially it resembles very much some of the smaller specimens of *ruficollis*, and less closely *tenellus*, but the relatively long antennae, more elongate subconical thorax and much more approximate eyes at once distinguish it.

51. **Hymenorus dorsalis** Schwarz

1878. *Hymenorus dorsalis* Schwarz, Proc. Am. Philos. Soc., XVII, p. 370. (Coleop. of Florida (w. LeConte)).

1919. *Hymenorus sabalensis* Blatchley, Can. Ent., LI, p. 67.

Head, thorax, under surface, legs and antennae rufous to dark rufo-castaneous, apical two-thirds of elytra black. Eyes separated in the male by one-fifth to one-third, and in the female by one-third to two-fifths their own width. Antennae a little longer than half the body, moderately slender, filiform, the median joints very feebly obconic and distinctly more than twice as long as wide. Protarsal claw with ten to fourteen teeth in the male and about eight or nine in the female.

Length, 5.25 to 7 mm.

A not uncommon species in Florida and at Mobile, Southern Alabama, (Löding). A specimen in Mr. Frost's collection from Southern Pines, North Carolina, is nearly unicolorous but seems otherwise identical.

As indicated above there is quite a bit of variation in the degree of approximation of the eyes, and also in the distinctness of the reddish tint of the thorax and elytral base. The pronotal punctuation is coarse and as a rule rather close, but in occasional specimens becomes much sparser, with however intermediate grades.

The *H. sabalensis* of Blatchley was based on a single specimen taken at Hog Island, Dunedin. It differs in scarcely any respect from ordinary *dorsalis* except in its more sparsely punctate

thorax. I have taken at the same time and from the same tree at St. Petersburg, Florida, precisely similar specimens associated with others with more closely punctate thorax, and at present see no possibility of separating them on this ground.

52. **Hymenorus discretus** Casey

1891. *Hymenorus discretus* Casey, Ann. N. Y. Acad. Sci., VI, p. 105. (Coleop. Notices, III).

This species is especially notable for having the sides of the prothorax quite distinctly explanate toward the hind angles. Among the few species of the genus occurring in the Northeastern States, this one has the pronotum more coarsely densely punctate and dull than any other. The elytra are moderately shining though finely alutaceous. The distance apart of the eyes varies to an unusual degree in the male, ranging in the series before me from rather less than two-fifths to fully three-fourths the width of the eye in this sex and from one-half to three-fifths the ocular width in the female. Length, 6 to 7 mm. in my series. Casey gives an extreme of 7.4 mm.

The species is known to me from Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania. Blatchley reports it from Indiana.

53. **Hymenorus caducus** new species

Closely related to *dorsalis* and *discretus*. From the former it is at once distinguished by the uniformly dark brown or piceous upper surface, and from both by the narrower form and generally smaller size. In *discretus* the prothorax is rather more than one-half wider than long; in the present species less than one-half wider than long. In the male the antennae are a little longer than half the body, in the female slightly shorter, and in both sexes not quite so stout as in the corresponding sex of *discretus*. The prothorax is even a little more densely and relatively more coarsely punctate than in *discretus*.

Length, 5.2 to 5.5 mm.; width, 1.9 to 2.2 mm.

Described from a single pair; the male type received from Mr. Löding and bearing label "Oak Grove, Ala., Apr. 8, Th. Van Aller"; the female from Mr. Blatchley, who took it at Dunedin, Florida, March 31.

In the male the eyes are separated on the front by barely two-fifths, and in the female by only one-third their own width. There are about thirteen teeth in the protarsal claw of the male and nine or ten in the female. In *discretus* the eyes are usually appreciably more distant, but this character is quite unstable in both this species and *dorsalis*, and is likely to prove so in *caducus*.

54. **Hymenorus thoracicus** new species

Elongate-oval, elytra flavotestaceous, the thorax and head varying from concolorous to piceous, body beneath darker reddish brown; pubescence short, fine, rather dense and decumbent, integuments dull.

Antennae somewhat stout, little more than two-fifths as long as the body, third joint distinctly longer than the fourth, median joints moderately strongly obconical and three-fourths to four-fifths as wide as long. Epistoma densely punctate, punctures of front separated by their own diameters or less. Eyes distant from one-half to two-thirds their own width, the difference mainly sexual but to some extent individual.

Prothorax about one-half wider than long, sides broadly rounded to apex, nearly parallel for a short distance only at base; surface densely finely punctate and opaque and devoid of any perceptible discal impression.

Elytra three times as long as the thorax, the sides almost perfectly continuous with those of the latter and at middle only slightly wider; striae very fine and scarcely impressed; strial punctures fine, those of the intervals numerous and still more minute, there being as a rule four or five in the interstitial width.

Propleura punctate nearly or quite to the outer margin; ventral segments one to three finely rather sparsely punctate, the males with a dense patch of fine punctures and pubescence at the middle of each; females also with these segments more finely closely punctate at middle but less so than in the male. Basal joint of hind tarsus subequal to the remainder; comb of protarsal claw with about ten or twelve teeth in the male and about six in the female.

Length, 4.5–5.5 mm.; width, 1.75–2.35 mm.

Southern California: La Puerta Valley, San Diego County, (Geo. H. Field); Indio, (F. Stickney). Ten examples; type male from "San Diego County."

This very distinct species is notable for the variation in the color of the thorax, which in the male is as a rule more or less

piceous throughout, though occasionally scarcely darker than in the female, in which it is nearly concolorous with the elytra in all specimens seen. In material recently sent me by the California Academy there are examples of this species collected at Gila Bend, Arizona, by Mr. Van Duzee and Mr. Martin.

55. **Hymenorus testaceus** Casey

1891. *Hymenorus testaceus* Casey, Ann. N. Y. Acad. Sci., VI, p. 110. (Coleop. Notices, III).

The outstanding feature of this species is the rather broadly nearly evenly elliptic oval strongly convex form. The color varies from bright to dark rufo-testaceous, the surface finely alutaceous yet quite distinctly shining. The prothorax is coarsely moderately closely punctate, the punctures separated by less than their own widths. The eyes are distant in the male by about three-fifths, and in the female by four-fifths to five-sixths their own width. Antennae somewhat slender and filiform, intermediate joints about twice as long as wide. Propleura smoother externally; ventral segments similarly sparsely punctate and shining in the sexes. Comb of protarsal claw with about thirteen or fourteen teeth in the male and about eight in the female.

Length, 6 to 6.75 mm.

All specimens seen are from Arizona. The following localities are represented before me: Nogales, Chiricahua, Huachuca and Baboquivari Mountains. Casey does not specify a precise locality for his type series.

56. **Hymenorus disparatus** new species

Elongate oblong-oval, dark fuscous brown; antennae, legs and lower surface paler; pubescence moderate, fulvous, inclined; elytra distinctly shining, thorax somewhat duller. Head coarsely punctate, eyes separated by about three-fifths their own width in the male, and by their own width in the female. Antennae in the male nearly half the length of the body, scarcely at all serriform, the third joint just perceptibly longer than the fourth, the median joints fully twice as long as wide; in the female a little shorter and less filiform.

Prothorax two-fifths wider than long, evidently narrower than the base of the elytra, sides broadly arcuately divergent to the hind angles in the male, a little more parallel behind in the female; surface coarsely punctate, the punctures separated by their own diameters more or less on the disk but more approxi-

mate antero-laterally, the interspaces nearly smooth and more shining in the male, but duller and somewhat rugulose in the female.

Elytra twice as long as wide, not quite four times as long as the thorax, and at middle one-third wider than the latter; sides subparallel in basal half or more; striae evidently impressed, strial punctures close set and rather coarse; interspaces sparsely, finely, irregularly biserially punctate and shining.

Propleura not closely punctate, the interspaces between the punctures strigoso-rugulose; ventral segments one to three nearly uniformly and sparsely punctate; comb of protarsal claw with about ten or twelve teeth in the male, usually one or two less in the female.

Length, 6.6–7 mm.; width, 2.5–2.75 mm.

Described from six examples (2♂, 4♀) from Alpine, Texas, all collected by Poling in May and June 1926. The type is a male.[3]

57. **Hymenorus oblivius** new species

Elongate oblong-oval, dark piceous brown, antennae and legs reddish brown; pubescence very short, subrecumbent, dull fulvous, not conspicuous; surface luster dull. Antennae rather slender, not quite attaining the middle of the length, not at all serriform, intermediate joints feebly obconic and rather more than twice as long as wide. Front rather finely and closely punctate between the eyes, which in the male are separated by about five-sixths their own width, and in the female by their own width.

Prothorax slightly more than two-fifths wider than long, sides broadly rounded in front, becoming nearly straight for a short distance before the rectangular hind angles; surface very finely and densely punctate.

Elytra not quite twice as long as wide, a little more than three times as long and nearly one-third wider than the thorax. Striae fine, feebly impressed and very finely punctured; punctures of intervals only a little finer than those of the striae, about four in the width of the interspace.

Propleura more sparsely punctate externally, ventral segments one to three minutely alutaceous and somewhat shining, finely sparsely punctate, a little more closely so at middle in both sexes. Basal joint of hind tarsus a little longer than the remainder; comb of protarsal claw with about twelve teeth in the male and seven in the female.

Length, 6–7.4 mm.; width, 2.5–2.7 mm.

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[3] Since writing the above I have seen specimens from Colorado, Paradise, Ariz. [Liebeck Coll.] and Silver City, N. Mex., (J. B. Wallis).

Described from four examples (1♂, 3♀) collected at Alpine, Texas, May 1926, by O. C. Poling. The male is taken as the type.

This species resembles very much *indutus* Csy. but differs in its more transverse thorax, and especially by its more slender antennae with intermediate joints at least twice as long as wide, whereas in *indutus* they are only about one-third or one-fourth longer than wide.

58. **Hymenorus alienus** new species

Stout, oblong-oval, strongly convex, dark fuscous brown, beneath reddish brown, legs and antennae a little paler; upper surface alutaceous and dull; pubescence very short and inclined, fulvous.

Head densely not very coarsely punctate. Eyes in both sexes separated by about three-fourths their own width. Antennae slender, not perceptibly serriform, the intermediate joints a little obconic and twice as long as wide.

Prothorax three-fifths wider than long, apex broadly rounding into the sides, the latter becoming subparallel for a short distance at base; surface rather finely extremely densely punctate, the punctures virtually in contact at all parts of the disk, median basal impressions very faint.

Elytra not quite three times as long as the thorax and two-thirds longer than wide; at base almost exactly equal in width to the thorax, and at middle about one-twelfth wider than the latter. Striae distinctly impressed; strial punctures moderate; intervals thickly finely punctate, there being on an average about four in the width of the interval.

Propleura not appreciably smoother laterally; metasternum unusually coarsely and densely punctate; abdomen strongly shining, not at all alutaceous, but with some fine strigosity near the lateral margins, punctuation moderately fine and sparse. Basal joint of hind tarsus about one-third longer than the remainder; protarsal claw with about eighteen teeth in the male and ten in the female.

Length, 7.25 to 7.65 mm.; width, 2.7 to 3.1 mm.

Santa Rita Mountains, Arizona, 7–24–1927, (P. A. Readio), [Kansas Univ. Coll.]; Chiricahua Mountains, [California Acad. Coll.].

The type is one of two female specimens received from the Kansas University collection; the other collected by Prof. Snow, also in the Santa Rita Mountains, has been returned to the University.

This species agrees so nearly with *grandicollis* in all general features, notwithstanding its very much more distant eyes, that at first, in the absence of the male, I tentatively assigned it to this group of species, which is characterized by a more or less distinct protibial tumidity in the males. On later acquiring a male however it proved to have quite simple protibiae. In any case the unusually coarsely punctate metasternum will separate *alienus* from any species of the *grandicollis* group, as well as from those species with which it now becomes necessary to associate it. The more numerous teeth of the protarsal claws—about eighteen in the male and ten in the female, as compared with twelve and seven respectively in *oblivius*—will at once distinguish it from the latter species.

59. **Hymenorus inaequalis** Casey

1891. *Hymenorus inaequalis* Casey, Ann. N. Y. Acad. Sci., VI, p. 114. (Coleop. Notices, III).

This is a conspicuously distinct species; the moderately large size (7 mm.), notably convex form, coarsely extremely densely punctate prothorax contrasting sharply with the finely punctured and strongly shining elytra, the rather long and bristling pubescence and the propleura coarsely densely punctate to the extreme margin, forming a combination of characters which should make it easily recognizable.

Three female specimens only are known to me, and all are from Arizona. These are the unique type, without more definite locality; a specimen in the California Academy collection from Globe, and one in my own collection from the Baboquivari Mountains.

60. **Hymenorus idoneus** new species

Rather stout oblong-oval, upper surface finely alutaceous and somewhat dull; pubescence short, sparse, semi-erect and inconspicuous. Antennae rather stout and short, little more than one-third the length of the body, third joint slightly longer than the fourth, median joints obconic and about one-half longer than wide. Head five-eighths as wide as the thorax, sparsely punctate between the eyes; eyes in the male separated by two-thirds their width.

Prothorax nearly seven-tenths as long as wide, sides nearly parallel or very slightly convergent from the middle to the base, moderately arcuately convergent in front; surface rather coarsely

subevenly punctate, the punctures separated by less than their own diameters as a rule.

Elytra one-fourth wider than the prothorax and not quite four times as long, twice as long as wide; sides just visibly arcuate and subparallel for more than half their length; striae evidently though feebly impressed, strial punctures moderate; interspaces very finely sparsely punctate, the punctures tending to form a single series posteriorly.

Propleura sparsely punctured, ventral segments one to three sparsely nearly evenly punctate, fourth and fifth more finely and remotely punctured as is usual. Basal joint of posterior tarsus distinctly longer than the remainder; comb of protarsal claw with about ten teeth in the male.

Length, 8 mm.; width, 3.2 mm.

Baboquivari Mountains, Arizona, (Poling). Two male specimens.

The very sparsely punctate elytral intervals as above described constitute the chief diagnostic feature of this species, and at once separate it from any other with which it could possibly be confused.

61. **Hymenorus tritus** new species

Elongate oblong-oval, distinctly depressed, dark brown, legs and antennae paler, luster dull; pubescence short and appressed, fulvous.

Head somewhat sparsely punctate between the eyes, more densely posteriorly. Antennae about three-fifths the length of the body, rather stout, intermediate joints obconic, scarcely one-half longer than wide. Eyes separated on the front by one-half their own width or a little more, differing very little in the sexes.

Prothorax about three-eighths wider than long, sides nearly parallel for a short distance at base, convergent in front and rounding into the apex; disk feebly convex, not impressed, densely finely punctate and distinctly alutaceous.

Elytra at base about one-sixth and at middle one-fourth wider than the prothorax, sides parallel and feebly arcuate in basal two-thirds; striae rather fine, moderately punctate; intervals strongly alutaceous and dull, punctures fine, subaspirate, about three in the width of the interspace.

Propleura moderately punctate internally, becoming nearly smooth externally. Ventral segments one to three sparsely finely punctate. Basal joint of hind tarsus subequal to the remainder. Comb of protarsal claw with about fourteen or fifteen teeth in the male and seven or eight in the female.

Length, 6 to 7 mm.; width, 2 to 2.6 mm.; one very small male measures only 5.2 mm. in length.

Baboquivari Mountains, Arizona, July and September, (Poling); 21 examples. The type is a male bearing date IX–25–'23. Recently specimens from Oracle, Arizona, collected by Van Duzee and Martin have been sent to me by the California Academy.

62. **Hymenorus incertus** new species

Oblong-oval, moderately elongate; fuscous brown above, scarcely shining, reddish brown beneath; pubescence short, inclined, fulvous.

Head coarsely closely punctate; eyes (♀) separated by slightly less than their own width. Antennae very nearly half the length of the body, moderately stout, scarcely serriform, median joints moderately obconic, a little less than twice as long as wide.

Prothorax one-half wider than long, sides parallel and nearly straight in basal two-fifths, hind angles rectangular, front angles undefined, an evident impression at middle of base; punctuation rather coarse and close, the punctures separated on the disk by about one-third their own diameters as a rule.

Elytra not quite four times as long as the thorax, at base about one-fifth and at middle nearly two-fifths wider than the latter; sides subparallel and feebly arcuate to beyond the middle; striae and strial punctures moderate, intervals finely not closely punctate.

Propleural sculpture somewhat sparser externally; metasternum finely sparsely punctured medially; ventral segments not appreciably more closely punctured at middle; basal joint of hind tarsus subequal to the remainder; comb of protarsal claw (♀) with about seven teeth.

Length, 5.6 mm.; width, 2.25 mm.

Santa Rita Mountains, (Snow), Arizona. A single female specimen.

Notwithstanding the absence of the male it is almost certain that this species is properly referred to the present group, in which it can only be compared with *intermedius*. This latter however is a rather narrower species with virtually unimpressed thorax, which is also somewhat less transverse, and the eyes are appreciably less distant in the female. In the male of *simiolus* the eyes are somewhat less distant than their own width, but in the female they are more widely separated than their own width and by this means the species is easily separated from *incertus* or *intermedius*.

63. **Hymenorus intermedius** Casey

1891. *Hymenorus intermedius* Casey, Ann. N. Y. Acad. Sci., VI, p. 102. (Coleop. Notices, III).

This small species (5 to 5.5 mm.) possesses no special structural features and there is little to add to the tabular characters. The eyes are distant from three-fifths to four-fifths their own width, not one-half their width as given by Casey, who is often materially inaccurate in these measurements. The antennae are perceptibly stouter than in the closely related species.

Casey gives Texas as the locality of his type series. Four examples from Arizona seemingly identical have been given me by Mr. Liebeck.

64. **Hymenorus indutus** Casey

1891. *Hymenorus indutus* Casey, Ann. N. Y. Acad. Sci., VI, p. 119. (Coleop. Notices, III).

Dark brown, integuments very densely finely punctate and dull, length 5 to 7 mm. Closely related and extremely similar to *punctatissimus*, which see for a statement of the principal differences.

Casey's description is drawn from an aggregation of specimens from El Paso, Texas, New Mexico, and Arizona. He expresses a suspicion that his series may include two or three closely allied but distinct species and states that the El Paso examples are to be regarded as typical. Specimens before me from Fort Stockton, Texas, and Eddy County, New Mexico, [Kansas Univ. Coll.], appear to be in every way identical with the latter. In these the antennae are nearly as short and stout as in *punctatissimus*, the intermediate joints not more than one-third longer than wide, and the eyes are separated by five-sixths to fully or even slightly more than their own width (a little less distant in *punctatissimus*). Strictly speaking the ventral punctuation is slightly closer medially in the male than in the female but the difference is not obvious enough to be of tabular weight.

65. **Hymenorus punctatissimus** LeConte

1866. *Hymenorus punctatissimus* LeConte, Smiths. Misc. Coll., VI, No. 167, p. 138. (New Species of N. Am. Col., pt. I, 2d Ed.).

1891. *Hymenorus macer* Casey, Ann. N. Y. Acad. Sci., VI, p. 118. (Coleop. Notices, III).

This small species was described by LeConte in 1866 from a unique female specimen collected in "Arizona," and is the first species to be made known from that territory.

In the series before me the length varies from 4.25 to 6 mm., the average and usual length being around 5 mm. The form is rather narrow and somewhat depressed, the color varying from pale ferruginous to piceous brown, the legs and antennae paler, at least in the darker examples. The luster is dull owing to the fine and very dense punctuation; the pubescence short, reclinate, plentiful and dull yellowish in color. The eyes are distant on the front from four-fifths to fully their own width, the variation being to a considerable extent independent of sex. The antennae are short and stout, being but little more than one-third the length of the body, the intermediate joints not much longer than wide. The prothorax is about one-half wider than long, the sides subparallel in nearly the basal half so that the width at middle is equal to that at base. Elytra only just visibly wider at base than the thorax; striae fine and lightly impressed, the strial punctures nearly as fine as those of the intervals, which are very numerous, with four or five in the interstitial width. Propleura densely sculptured to the extreme margin; metasternum and venter shining, the latter more numerously punctate at middle than at sides, and in the male with a small group of finer punctures at middle of first and second segments, sometimes vaguely indicated on the third segment; comb of protarsal claw with about nine teeth in the male and six or seven in the female.

Punctatissimus is a common species throughout the southern parts of Arizona and California and extends northward into Utah and Nevada; examples in my collection from Western Texas seem also to be identical. These latter resemble very closely Casey's *indutus* from the same region and I doubt if it will be possible in all cases to separate the females of the two species with certainty. The males of *indutus* may be at once distinguished by the absence of the small aggregation of finer punctures at the middle of the first two ventral segments and by the wider, apically obliquely narrowed and sharply acuminate oedagus. In *punctatissimus* the oedagus is more slender and filiform, the sides feebly sinuate at middle giving the appearance

of a very slight elongate dilatation of the apex, the tip rounded rather than acuminate. Aside from these differences we can only say that *indutus* is usually a little larger, with the narrowing of the thorax beginning as a rule further back so that it is not quite as wide at middle as at base, and the eyes are slightly more distant.

The following are among the numerous localities represented in the *punctatissimus* material examined. ARIZONA: Texas Pass; Fort Grant; Maricopa County. CALIFORNIA: Pasadena; Pomona; Elsinore; Warner's Ranch; Riverside; Poway; La Puerta Valley, San Diego County; Palm Springs; Owens Lake; Kaweah; Folsom. NEVADA: Sutro. UTAH: Hurricane; St. George. TEXAS: Fort Bliss; Fort Davis.

H. macer Csy. is included with the above as I can find nothing on which to base a separation.

66. **Hymenorus confertus** LeConte

1866. *Hymenorus confertus* LeConte, Smiths. Misc. Coll., no. 167, p. 136. (New Sp. N. Am. Col., pt. I, 2d Ed.).

Similar in general size and aspect to *punctatissimus* and rather difficult to distinguish by description. When placed side by side and examined attentively the most obvious difference lies in the coarser and less dense elytral punctuation, the interspaces in *confertus*, though very numerously punctate, having as a rule only three punctures in the width of the interval instead of four to five as in *punctatissimus*.

The LeConte collection contains only two specimens truly belonging to this species, a female and a male, the former on the name label. In both the eyes are separated by about four-fifths their own width. In the male the abdomen is more numerously punctate at middle and shows more or less feeble traces of the small groups of finer punctures at the middle of the first two or three segments.

LeConte's types were from Cape San Lucas, Lower California. My own collection contains examples from Cape San Lucas and Santa Rosa, Lower California, which agree well with the LeConte types. I have as yet seen no specimens of *punctatissimus* from Lower California though the species should occur in the northern part of the peninsula.

67. **Hymenorus granulatus** Blatchley

1912. *Hymenorus granulatus* Blatchley, Can. Ent., XLIV, p. 331. (Desc. Fla. Coleop.).

The deep black color, short third antennal joint and rugose granulate punctate elytral interspaces mark this as one of the most unique and isolated species of the genus. No other species known to me is so completely and unequivocally black; only the few species of the *obscura* group show a similarly short third antennal joint, and the granulose elytra constitute a wholly unique feature. In the male paratype before me which I owe to the kindness of friend Blatchley, the eyes are separated by about four-fifths their own width; antennae half the length of the body, stout and compressed, the intermediate joints strongly obconic or subtriangular; prothorax rather small and very densely coarsely punctate. The very dense sculpture of the entire upper surface gives it a dull luster at a little distance, but when examined under moderate power the integuments are seen to be polished and strongly shining. The pubescence is rather long, semi-erect and quite black. Length, 6.5 mm. in the specimen at hand. Blatchley says 7 to 7.5 mm.

The few known specimens are said by its author to have been beaten from scrub oak at Sanford, Florida, March 28–29, 1911.

68. **Hymenorus dichrous** Blatchley

1919. *Hymenorus dichrous* Blatchley, Can. Ent., LI, p. 66.

Similar in size, form and type of coloration to *dorsalis*, but the reddish tint of the anterior half of the body is in the few specimens seen darker than is usual in the latter, the thorax especially tending to become duller and more brownish than the base of the elytra. The antennae are a little shorter and distinctly less slender than in *dorsalis*, the median joints perceptibly less than twice as long as wide. The eyes are separated by five-sevenths their own width in the only male at hand, and by two-thirds to four-fifths their width in the female. The prothorax as compared with *dorsalis* is slightly less transverse, less rapidly narrowed anteriorly, the sides not at all inflated or incurved posteriorly, the hind angles not distinctly flattened or deplanate; punctuation coarse and moderately close to rather dense. Elytra scarcely visibly alutaceous and more shining than in *dorsalis*, the punctures

both of the striae and interspaces perceptibly coarser than in the latter species. Length, 5.4 to 6.3 mm.; width, 2.25 to 2.5 mm.

Four examples (1♂, 3♀) of this species are before me, the male submitted by Mr. Frost and bearing label Southern Pines, North Carolina, 11–27–11, A. H. Manee; the females collected by Mr. Blatchley at Dunedin, Florida. A fifth specimen labeled "S. C." and placed with *dorsalis* in the LeConte collection appears to belong here; its sex is indeterminate in its present condition.

There are thirteen or fourteen teeth in the comb of the protarsal claw in the North Carolina male, and nine in one of the Florida females.

Dichrous was described by Blatchley from a composite series made up partly of the present species and partly of typical *dorsalis*, and his diagnosis includes characters of both species:—e.g. the specimens which from their more approximate eyes he called males (though really they included both sexes) were *dorsalis*, while those with more distant eyes (his assumed females) belong to the present species. The supposed *dorsalis* with which he compared them in the remarks following his description is not the true *dorsalis* but rather the *semirufus* of the present paper.

The type of *dichrous* is a female from Dunedin, Florida, bearing date "1–22–27," and is in the Blatchley collection.

69. **Hymenorus densus** LeConte

1866. *Hymenorus densus* LeConte, Smiths. Misc. Coll., no. 167, p. 138 (New Sp. N. Am. Col., pt. I, 2d Ed.).

This common and well known species needs little comment. The form is elliptic-oval and rather strongly convex; as usually colored the head, thorax, sterna and legs are rufo-ferruginous, with the elytra, abdomen and antennae except at base fuscous; not rarely the entire upper surface is piceous. The antennae are short and stout, the intermediate joints obconic and but little longer than wide; the eyes are distant four-fifths to five-sixths their own width. Length, 5 to 6 mm.

By far the greater number of specimens seen are from Florida. Casey gives also Texas and Ohio, the latter locality based on a

few specimens so labeled in the Julich collection. Mr. Dury however writes me that these "Ohio" specimens were actually taken by himself in Florida and were erroneously labeled by Julich. I have seen no Texas specimens as yet but examples from the vicinity of Mobile, Alabama, have been sent me by Mr. Löding and I seem to recall having seen others from the Carolinas though none such are now at hand.

70. **Hymenorus convexus** Casey

1891. *Hymenorus convexus* Casey, Ann. N. Y. Acad. Sci., VI, p. 106. (Coleop. Notices, III).

Somewhat similar to *densus* in its oval strongly convex form, but larger and a little stouter, body entirely piceous above and brownish piceous beneath, the entire antennae as well as the legs rufous. The antennae are rather stout, but longer than in *densus* and with the median joints fully one-half longer than wide. The elytral striae are deeper and more coarsely punctate than usual. Length, according to Casey, 6.8 to 7.5 mm. My own specimens are smaller, ranging from 6 to 6.5 mm.

This species is very distinct from anything else in our territory and I suspect may show a greater affinity with the West Indian fauna than with our own. All specimens seen by me are from Southern Florida or the "Keys." Casey gives also Texas, but I suspect there is here some error in labeling.

71. **Hymenorus tenuistriatus** new species

Elongate-oval, parallel, quite strongly convex, brown, beneath castaneous, the ventral apex darker, legs nearly concolorous; elytra somewhat shining; pubescence short, inclined, fulvous.

Head densely punctate; eyes separated by about four-fifths their own width in the male, slightly more remote in the female. Antennae two-fifths the length of the body, intermediate joints obconic and about one-half longer than wide.

Prothorax two-fifths wider than long, rather obtusely rounded in front, sides parallel and nearly straight behind the middle, base just perceptibly less wide than the base of the elytra; punctuation rather coarse, very dense, the punctures not quite in contact at the middle of the disk, but virtually so elsewhere.

Elytra three-fourths longer than wide, sides parallel in basal two-thirds, striae and strial punctures extremely fine; intervals

flat, moderately punctate, not perceptibly alutaceous between the punctures.

Propleura nearly uniformly though not densely punctate; metasternum sparsely rather finely punctured at middle, becoming gradually more coarsely so at sides; ventral segments sparsely finely punctate; basal joint of hind tarsus perceptibly shorter than the remainder.

Length (type), 6 mm.; width, 2.25 mm.

Mobile, Alabama, (Löding); Southern Pines, North Carolina, (Manee). The type is a female from the first named locality and bears date VI–10–22.

The parallel convex form, very densely punctate thorax, and extremely fine elytral striae characterize this species. The comb of the protarsal claw has about ten teeth in the male and six in the female.

72. **Hymenorus tenellus** Casey

1891. *Hymenorus tenellus* Casey, Ann. N. Y. Acad. Sci., VI, p. 115. (Coleop. Notices, III).

1918. *Hymenorus elbertae* Blatchley, Can. Ent., L, p. 57.

In certain respects, notably in color, this little species is suggestive of *densus*, but on critical comparison the smaller size, more slender subparallel and less convex form mark it as abundantly distinct from the latter. Casey describes his specimens as dark rufotestaceous throughout, but as a matter of fact in his type the elytra are darker in tint than the head and thorax, though the contrast is less marked than in certain examples in my own collection which are otherwise identical. A similar lack of constancy in the relative tints of thorax and elytra exists in *densus* and has also been noted in several other species. The antennae in *tenellus* are entirely rufous and not quite so short and stout as in *densus*. The eyes are separated by four-fifths to five-sixths their own width in the male, and by slightly more than their own width in the female. Length, 4.5 to 5 mm.

FLORIDA: Crescent City (type); Enterprise; La Belle; Dunedin, (Blatchley). Two specimens from the last named locality are before me, sent me by Mr. Blatchley as paratypes of his *elbertae*. In these the contrast in color between the thorax and elytra is as distinct as in typical *densus*, but this is a variable character and I see nothing else to distinguish them from *tenellus*.

73. Hymenorus fusicornis Casey

1891. *Hymenorus fuscicornis* Casey, Ann. N. Y. Acad. Sci., VI, p. 112. (Coleop. Notices, III).

Of rather stout oblong-oval form; elytra black or nearly so, head and thorax varying from piceous to dark rufous, body beneath rufo- to piceo-castaneous, legs and antennae dark rufous; pubescence fuscous, inconspicuous. Front sparsely punctate and shining, eyes distant by fully to slightly more than their own width. Antennae stout, compressed and distinctly attenuate, median joints one-fourth to one-third longer than wide. Prothorax and elytra very finely punctate. Propleura smoother externally; comb of protarsal claw with about fifteen or sixteen teeth in the male, eight or nine in the female. Length, in the series before me, 5 to 6.2 mm. Casey gives 6.8 mm. for his unique female type.

All specimens known to me are from Southern California. Those in my cabinet bear labels—San Diego, Jacumba, Riverside and Pasadena.

A very distinct species which it is scarcely possible to confuse with any other in our fauna.

74. Hymenorus rotundicollis Casey

1891. *Hymenorus rotundicollis* Casey, Ann. N. Y. Acad. Sci., VI, p. 111. (Coleop. Notices, III).

Length, 5.6 to 6.4 mm. Dark castaneous to piceous, legs concolorous with the under surface, antennae visibly paler. Antennae scarcely half the length of the body, median joints obconical, twice as long as wide; eyes separated by about their own width. Prothorax perceptibly wider than the base of the elytra and about equal to the median width of the latter. The terminal joint of the maxillary palpus is exceptionally wide, or as Casey describes it—"strongly dilated, as much so as in *Lobopoda*, the angle at the point of support being distinctly obtuse, and the apex much longer than either side and rather widely open and spongiose throughout its extent." For further details consult Casey's description.

This species is known to me only by the type series of four specimens in the Casey collection. The form of the thorax and that of the last palpal joint are the chief distinguishing features.

Habitat, "Arizona."

75. **Hymenorus inquilinus** Casey

1891. *Hymenorus inquilinus* Casey, Ann. N. Y. Acad. Sci., VI, p. 112. (Coleop. Notices, III).

Moderately robust, obtusely oblong-oval; rufotestaceous, the elytra still paler and more flavate; pubescence pale yellow. Antennae perceptibly but not strongly attenuate; eyes separated by distinctly more than their own width; head minutely sparsely punctulate. Prothorax unusually strongly transverse, perceptibly wider than the base of the elytra, about twice as wide as long, widest behind the middle, the sides arcuate throughout and incurved basally. Upper surface of both thorax and elytra very finely punctate and minutely alutaceous, the elytra almost completely devoid of impressed lines or serial punctures. Length, 4.5 to 5 mm.

CALIFORNIA: Mokelumne Hill, (Blaisdell); "North Fork," (H. Dietrich; taken with ants).

A remarkable inquilinous species, very distinct by its pale color, short inflated thorax, and absence of elytral striae except for a faint sutural line.

76. **Hymenorus seriatus** Casey

1891. *Hymenorus seriatus* Casey, Ann. N. Y. Acad. Sci., VI, p. 109. (Coleop. Notices, III).

Length, 5.5 mm. Form oval, moderately convex, widest at distinctly behind the middle of the length; color dark rufocastaneous, legs and antennae paler. Antennae rather slender, median joints moderately obconical and about twice as long as wide. Prothorax finely alutaceous and very coarsely closely punctate, the punctures not in actual contact as a rule. Elytra not evidently alutaceous, shining, strial punctures unusually coarse and close set, intervals rather strongly though relatively much more finely punctate.

Casey describes the eyes as separated by very nearly their own width in both sexes. In my single female example, determined by comparison with the type series, the distance asunder is perceptibly greater than the width of the eye. For further details consult Casey's description.

Habitat, ARIZONA: (type series); Baboquivari Mountains, (Poling); Huachuca Mountains, (J. O. Martin), [Calif. Acad. Coll.].

77. **Hymenorus brevis** new species

Rather broadly oval, piceous brown, legs a little more rufous, elytra somewhat shining though very finely alutaceous, pubescence dull fulvous. Antennae a little less than half as long as the body, rather slender, the median joints about three-fourths longer than wide. Head between the eyes polished, loosely punctate; eyes in the female separated by very slightly more than their own width.

Prothorax almost as wide as the elytra at base, three-fifths wider than long, sides parallel in basal fourth, thence gradually more strongly curving into the apex. Surface densely moderately coarsely punctate, the punctures almost or quite in contact throughout.

Elytra oblong-oval, sides more arcuate than usual, three-fifths longer than wide, three and one-half times as long and at middle two-fifths wider than the thorax; striae moderately impressed and closely rather strongly punctate; intervals finely irregularly punctate, three punctures as a rule in the width of the interspace.

Propleura sparsely punctate externally; ventral segments one to three rather strongly subevenly punctured, the fourth only slightly less closely so. Basal joint of hind tarsus fully as long as the remainder; comb of protarsal claw with about seven teeth.

Length (head raised), 7 mm.; width, 3.2 mm.

Described from a single female specimen from Arizona sent me by Mr. Liebeck.

By Casey's table the present species runs easily to "15" under which it would be associated with *dissensus*, *seriatus* and *testaceus*. *Dissensus* is much smaller with much more coarsely punctate elytral striae; *seriatus* also has unusually coarsely punctate striae and is both smaller and less broad; *testaceus* differs in its more convex form, paler color and less widely separated eyes.

78. **Hymenorus rufovalis** new species

Elongate-oval, widest at the middle of the length, convex, rufotestaceous throughout, luster dull; pubescence fine, very short, subrecumbent, fulvous. Head finely closely punctate; eyes in the female distant by their own width. Antennae about two-fifths as long as the body, rather stout, not at all serriform, the median joints strongly obconic and about one-half longer than wide.

Prothorax two-fifths wider than long, sides broadly arcuate and nearly continuous with those of the elytra; surface very densely and finely punctate.

Elytra very little wider than the thorax and about four times as long as the latter (in horizontal projection), nearly two and four-tenths times as long as wide; striae very fine, strial punctures fine, close set and sublinear; interspaces numerously minutely punctate.

Propleura more sparsely punctate externally; ventral segments one to three rather sparsely and finely punctate, a little more closely so medially.

Length, 5 mm.; width, 2.1 mm.

Baboquivari Mountains, Arizona, Sept. 15–30. A single example collected by O. C. Poling.

The unique type is without doubt a female, the comb of the protarsal claw having only about seven or eight teeth. This species runs to "15" in Casey's table where it would be associated with *testaceus* by the characters there given. It differs from *testaceus* in its smaller size, more distant eyes, very much finer and denser thoracic punctuation, and notably by the comparatively minute and more numerous punctures of the elytral interspaces in which there are about five punctures in the width of the discal intervals whereas there are only three in *testaceus*. Because of the more distant eyes it is associated in the present paper with *seriatus* and *brevis* rather than with *testaceus*. From both these species it is distinguished by the much finer pronotal punctuation and by the more numerous interstitial punctures of the elytra, in addition to the characters given in the table.

79. **Hymenorus deplanatus** Champion

1888. *Hymenorus deplanatus* Champion, Biol. Cent.-Amer., Coleopt., IV, pt. 1, p. 440.

1891. *Hymenorus gemellus* Casey, Ann. N. Y. Acad. Sci., VI, p. 101. (Coleopt. Notices, III).

A small, subdepressed, oblong-oval, piceous brown, densely punctured and feebly shining species of very ordinary appearance, but possessing one unique distinctive character in the male, in which sex the middle tibiae are somewhat abruptly thickened or dilated at apex. The antennae are rather short and stout, the median joints strongly obconic and about one-third longer than wide; eyes distant by their own width or very nearly so in both

sexes. The length in the great majority of specimens is around 5 mm., but extremes of 4.5 and 5.9 mm. are present in the series before me.

This is apparently a common species in Southern Arizona. I have seen specimens from the Catalina, Huachuca, and Chiricahua Mountains; Fort Grant; Oracle; and Badger. It was described by Champion from Northern Sonora.

Casey's *H. gemellus* proves to be not distinct from the present species: his four examples are all females and the unmodified middle tibia in this sex failed to reveal their identity. It is not certain that his two supposed *deplanatus* really belong to that species.

80. **Hymenorus simiolus** new species

Oblong-oval, moderately elongate, fuscous brown; surface finely alutaceous, scarcely shining; pubescence coarse, subrecumbent, fulvous, moderately conspicuous. Antennae about two-fifths the length of the body, feebly subserriform, median joints rather strongly obconic and nearly twice as long as wide. Eyes separated in the male by slightly less, and in the female by slightly more than their own width; interocular surface rather strongly and closely punctate.

Prothorax one-third wider than long, widest at extreme base, hind angles rectangular, front angles not defined, the sides rounding into the apex; surface very densely and rather coarsely punctate, median impression quite distinct toward the base.

Elytra slightly more than three times as long as the thorax, at base distinctly wider than the base of the thorax in the female, but only slightly so in the male; elytral striae scarcely or very feebly impressed on the disk, closely punctate; interspaces more finely so, there being as a rule three punctures in the width of the interval.

Body beneath castaneous, legs and antennae more reddish; propleura punctate externally but less closely so; ventral segments one to three sparsely finely nearly uniformly punctate; basal joint of hind tarsus a little longer than the remainder; comb of protarsal claw with about thirteen teeth in the male and six or seven in the female.

Length, 6.2–7.9 mm.; width, 2.3–2.6 mm.

Alpine, Texas; 1♂ (type), 2♀, collected by Poling, May, 1926.

This species is very similar in size and facies to *fusculus* Csy., which occurs in Southern California. In the latter the antennae are not at all serriform in the male and the median joints are

less elongate, the thorax not quite so coarsely punctate, and both the propleura and ventral segments are more closely punctured.

81. **Hymenorus exilis** new species

Small and slender, piceous, base of antennae and legs paler, pubescence grayish fulvous, not very conspicuous, surface minutely alutaceous and feebly shining. Antennae a little less than half the length of the body, rather stout, not serriform, median joints feebly obconic and scarcely one-half longer than wide. Head closely punctate, eyes distant by slightly more than their own width.

Prothorax one-half wider than long, sides almost straight and parallel in basal half, thence rounded to apex, the front angles feebly evident; surface evenly convex, coarsely densely punctate, the punctures round, not evanescent behind, almost in contact throughout.

Elytra one-third wider and four times as long as the thorax, narrowly oblong-oval; striae finely impressed, moderately punctured; interspaces sparsely more finely punctate, two punctures in width as a rule.

Propleura and ventral segments throughout sparsely finely punctate. Basal joint of hind tarsus subequal to the remainder; comb of protarsal claw with about eight teeth.

Length, 4 mm.; width, 1.6 mm.

Huachuca Mountains, Arizona. A single example of uncertain sex though probably a male, submitted by Mr. Liebeck, who kindly allows me to retain the specimen.

The small size, slender form, piceous color, with thorax more parallel sided and less narrowed in front than usual, will probably serve to distinguish this rather exceptional little species.

82. **Hymenorus ruficollis** Champion

1888. *Hymenorus ruficollis* Champion, Biol. Cent.-Amer., Coleop., IV, pt. I, p. 438.

As typically colored—head and thorax rufo-ferruginous, elytra brownish and abdomen more or less dusky—this species deceptively resembles *densus*. Both *densus* and *ruficollis* are inconstant in coloration, but while in *densus* the head and thorax tend in some individuals to become piceous or fuscous like the elytra, in *ruficollis* the variation is in the opposite direction, the elytra becoming more or less rufous like the head and thorax. In *densus* the antennae are dark except at base, the thorax more conical with sides convergent from the base, and the eyes less

widely separated than their own width; in *ruficollis* the antennae are entirely rufous, the sides of the thorax become subparallel basally, and the eyes are more distant than their own width. Furthermore in the male of *ruficollis* there is a dense patch of squamiform hairs at the middle of the first ventral, no trace of which exists in *densus*. *Ruficollis* averages slightly smaller than *densus*, the usual length being about 5 mm.

All specimens seen by me from our territory are from Southern Arizona: Nogales, (Wickham); Texas Pass, [Cornell Univ. Coll.]; Santa Catalina Mountains, (J. O. Martin), [Calif. Acad.]. Champion's types were from Northern Sonora.

83. **Hymenorus facetus** new species

Oval, convex, moderately elongate, ferruginous brown throughout; pubescence plentiful, short, inclined, pale fulvous. Head densely strongly punctured; eyes in the female separated by fully one-third more than their own width. Antennae rather stout, not at all attenuate apically, a little longer than two-fifths of the body, median joints obconical and about one-half longer than wide.

Prothorax two-sevenths wider than long, sides arcuately diverging from the apex as usual, becoming parallel for a short distance at base; surface uniformly densely coarsely punctate, the punctures practically in contact but round and not polygonally crowded.

Elytra three times as long as the thorax and at middle two-sevenths wider, two-thirds wider than long; striae feebly impressed and rather coarsely punctate; interspaces moderately numerously not very finely punctate, surface somewhat shining.

Propleura densely punctate; ventral segments one to three rather strongly and numerously punctate, the first especially so. Basal joint of hind tarsus barely equal to the remainder; comb of protarsal claw with seven or eight teeth.

Length, 5.5 mm.; width, 2.35 mm.

Santa Rosa, Lower California. A single female specimen collected by Mr. Beyer.

By its suboval convex form this species runs to "15" of Casey's table, where it agrees most nearly with *dissensus*. This latter is a smaller species with less densely punctured thorax, more coarsely punctate elytral striae and stouter legs. It occurs at Galveston, Texas. In addition to the normal color differences, this species is distinguishable from *ruficollis* by its much more coarsely punctate thorax and more shining integuments.

84. **Hymenorus dissensus** Casey

1891. *Hymenorus dissensus* Casey, Ann. N. Y. Acad. Sci., VI, p. 109. (Coleop. Notices, III).

The principal feature of this species lies in the "very coarse, deep, perforate and approximate punctures of the elytral series." The size is small (4.4 to 4.8 mm.), the form oval and convex, the thorax rather more elongate than usual. The eyes are distant by one-third more than their own width; the median antennal joints feebly obconic and about one-half longer than wide; color castaneous, legs and antennae pale flavotestaceous.

Of this species I have seen only the type series in the Casey collection, taken at Galveston, Texas. The tabular characters will enable it to be readily separated from *facetus*, to which it seems most nearly allied.

85. **Hymenorus horrescens** new species

Rather narrowly oblong-oval, convex, castaneous to fuscous, head and elytra shining, prothorax dull from the density of the punctuation; pubescence rather long, suberect and bristling.

Head closely punctate between the eyes, not alutaceous; eyes separated in the male by just perceptibly more than their own width, a little more distant in the female. Antennae a little less than half the length of the body, not at all serriform, third joint distinctly longer than the fourth, intermediate joints moderately obconic and about twice as long as wide.

Prothorax two-fifths wider than long, sides convergent and straight from the base angles for fully half its length, thence more strongly converging and rounding into the apex; surface rather strongly evenly convex, not distinctly impressed, coarsely and very densely punctate.

Elytra at base distinctly wider than the thorax, and at middle three-sevenths wider than the latter; striae finely impressed, strial punctures moderate, interspaces shining, not alutaceous, rather sparsely and finely punctate.

Propleura densely punctate to the outer margin; ventral segments one to three sparsely nearly evenly punctate; basal joint of hind tarsus as long as the remainder; comb of protarsal claw with about ten teeth in the male and seven in the female.

Length, 5.5 to 6 mm.; width, 2.25 to 2.35 mm.

Alpine, Texas; July 15–Aug. 1, (O. C. Poling). A pair kindly given me by Mr. Dietrich, of which the male is taken as the type; a single female from Silver City, New Mexico, received from Mr. Wallis.

In its very densely punctate and dull prothorax, contrasting strongly with the sparsely finely punctate and conspicuously shining elytra, this species closely resembles *inaequalis* Csy., which however is of larger size, eyes not quite as widely distant as their own width even in the female, and probably somewhat closer in the male, antennae stouter, the median joints perceptibly less than twice as long as wide.

86. **Hymenorus milleporus** new species

Elongate-oval, dark brown, elytra feebly shining; pubescence short, recumbent, dull luteous.

Head extremely densely punctate throughout; eyes (♀) separated by about one-fifth more than their own width. Antennae rather slender, scarcely two-fifths as long as the body, intermediate joints fully twice as long as wide.

Prothorax obtusely parabolic, sides continually divergent to base, not perceptibly impressed, punctuation rather coarse and extremely dense, the punctures everywhere closely crowded.

Elytra just perceptibly wider than the thorax at base; sides parallel and nearly straight in basal two-thirds; striae lightly but perceptibly impressed; intervals finely numerously punctate, three to four punctures in the width of the interval.

Propleura closely punctate to the outer margin; metasternum finely punctate at middle, more densely and finely so posteriorly; ventral segments sparsely subevenly punctate; basal joint of hind tarsus a little longer than the remainder; comb of protarsal claw (♀) with about nine teeth.

Length, 8 to 8.5 mm.; width, 2.9 to 3 mm.

Described from three examples, apparently all females, collected by J. Kusche at Turkey Flat, 8000–9000 ft., Chiricahua Mountains, Arizona, July 27, 1927, and submitted by the California Academy of Sciences, to which the type and one paratype are returned; one paratype in the collection of the writer.

This species is notable for its large size among those with widely distant eyes.

87. **Hymenorus nevadensis** new species

Moderately elongate subovate, slightly wider posteriorly, reddish brown, elytra somewhat shining, thorax dull from the density of the punctuation; pubescence fine, short, much inclined, pale in color. Antennae about two-fifths as long as the body, rather slender, feebly serriform distally, median joints twice as long as wide. Eyes in both sexes separated by about one-fifth more than their own width.

Prothorax two-fifths wider than long, sides arcuately divergent throughout, becoming straighter but scarcely parallel basally; surface rather coarsely and very densely punctate, the punctures nearly in contact even at the middle of the disk.

Elytra at base barely perceptibly and at middle about one-fifth wider than the thorax; about three times as long as the thorax and fully twice as long as wide; striae very fine; strial punctures fine, close-set and sublinear; interspaces flat, finely punctate, three punctures in width as a rule.

Propleura scarcely smoother externally; metasternum densely finely punctate at middle, more sparsely and coarsely so laterally. In the male the extremely densely finely punctate area is more extensive than in the female and the transition to the coarser lateral punctuation is very abrupt. Ventral segments finely very sparsely punctate and shining; comb of protarsal claw with about eleven teeth in the male and seven in the female.

Length, 6.1 mm.; width, 2.1 mm.

Esmeralda County, Nevada, (Nunenmacher). Two examples.

This species is rather closely allied to *fusculus*, which differs in its darker color, prothorax less nearly equal in width to the elytra, more obtusely rounded in front with better defined anterior angles, less slender antennae, the median joints only about two-thirds longer than wide, more densely punctate elytral interspaces, the second a little wider than the third and with four punctures in width as a rule, while in *nevadensis* the second interspace is a little narrower than the third and with only two to three punctures in width. *Nevadensis* is extremely similar to *significans* except in metasternal sculpture, as indicated in the table.

88. **Hymenorus significans** new species

Narrowly oblong-oval, dark brownish castaneous, legs and antennae a little paler, last two ventral segments darker. Pubescence fulvous, inclined, moderately conspicuous. Integuments non-alutaceous and shining throughout, the thorax somewhat dull from the density of the punctuation.

Head rather small, eyes not prominent, separated in the male by about one-fifth more than their own width; punctures of front well separated. Antennae rather more than two-fifths the length of the body, third joint evidently longer than the fourth, intermediate joints moderately obconic, not quite twice as long as wide.

Prothorax strongly convex, two-fifths wider than long, widest at extreme base which is as wide as the base of the elytra, sides

moderately arcuately convergent in front, feebly so and with a slight sinuation behind the middle which does not attain the hind angles; surface rather coarsely and very densely punctate.

Elytra three times as long as the thorax and at middle one-sixth wider, sides nearly straight and parallel for two-thirds their length; striae finely impressed, rather strongly punctate, intervals finely sparsely punctate.

Propleura densely punctate to outer margin; ventral segments first to third sparsely nearly evenly punctate; basal joint of hind tarsus slightly longer than the remainder; comb of protarsal claw in the male with about twelve or fourteen teeth. On the posterior half of the metasternum at middle there is an oval densely punctate and pubescent area which is finely divided along the median line.

Length, 5.5 mm. (head deflexed); width, 2.3 mm.

Described from a unique male specimen collected by Poling at Alpine, Texas, Aug. 1, 1926, and submitted by Mr. Dietrich.

The general form, size and sculpture are nearly as in *horrescens* and *nevadensis;* the pubescence is however shorter and less erect, the thorax wider at the base and the eyes a little more distant than in *horrescens,* which, moreover, lacks the lateral sinuation of the sides of the thorax and shows no trace of the metasternal pubescent area in the male. *Nevadensis* is still more closely related to the present species, and except for the differences in metasternal sculpture the two species are scarcely distinguishable.

89. **Hymenorus fusculus** Casey

1891. *Hymenorus fusculus* Casey, Ann. N. Y. Acad. Sci., VI, p. 117. (Coleop. Notices, III).

A moderately elongate oblong-oval species of very ordinary appearance, dark fuscous brown when fully colored, very densely but not coarsely punctate throughout above, luster dull or only feebly shining. The antennae are rather slender, median joints about one-half to two-thirds longer than wide; eyes distant their own width or a little more, the greater distance usually pertaining to the female but not always so. The pectination of the protarsal claw has about twelve or thirteen teeth in the male and eight or nine in the female; first ventral of male with a small area of denser finer punctures at middle. In the dozen examples before me the length varies from 5.75 to 6.3 mm.

Casey's type was from Coronado Beach, California. The following localities, all in Southern California, are represented in

the material at hand: San Diego County; Coronado; Warner's; Palm Springs; Redlands; Pasadena.

The smaller examples of this species bear a superficial resemblance to *confertus* and *punctatissimus*, but the antennae in these latter species are perceptibly shorter and stouter and the eyes as a rule less widely separated.

90. **Hymenorus conicicollis** new species

Rather narrowly elongate-oval, moderately convex, black, shining, the prothorax dulled by the density of the punctuation; antennae piceous, basal three joints pale; legs entirely rufo-testaceous; pubescence pale, moderately conspicuous.

Head densely punctate; eyes separated by slightly more than their own width; antennae with third joint slightly but perceptibly shorter than the fourth, median joints somewhat obconic and nearly twice as long as wide (outer joints wanting).

Prothorax unusually elongate, scarcely more than one-third wider than long, sides straight and strongly convergent from base to nearly apical fourth, thence rather strongly rounded into the apex; surface very densely and coarsely punctate throughout.

Elytra distinctly wider at base than the base of the thorax, humeri narrowly exposed, a little more than twice as long as wide and about four times as long as the thorax, widest at about the middle, the sides subparallel and feebly arcuate in basal two-thirds; striae moderately impressed, strial punctures coarse; interspaces strongly shining, not visibly alutaceous, two punctures in their width as a rule.

Propleura coarsely densely sculptured to the outer edge; metasternum and ventral segments polished, the former rather coarsely subevenly punctate throughout, the latter more sparsely and finely so, the punctures not closer medially, last segment smoother.

Length, 6.75 mm.; width, 2.6 mm.

Described from a single male specimen bearing label—"Spring Creek, Ga., 18–21 May '16, J. C. Bradley." The type is by courtesy of the Cornell Museum authorities deposited in my collection.

91. **Hymenorus quietus** new species

Elongate oblong-oval, convex, brown, legs rufo-ferruginous; integuments not evidently alutaceous, somewhat shining; pubescence rather long, luteous.

Head closely punctate, eyes (♀?) separated by a distance fully one-third greater than their own width. Antennae about

two-fifths as long as the body, not at all serriform, the intermediate joints distinctly obconical and not quite twice as long as wide.

Prothorax scarcely three-fifths wider than long, sides parallel and almost straight in basal two-fifths, thence gradually more strongly arcuate to the obsolete front angles; surface densely rather coarsely evenly punctate, the punctures everywhere almost in contact.

Elytra at base just visibly wider and at middle about one-fourth wider than the prothorax, narrowly oval with sides evidently arcuate throughout; striae rather deeply impressed and entire, rather coarsely closely punctate; intervals flatly convex, strongly confusedly punctate.

Propleura coarsely sculptured to the outer margin; metasternum and venter moderately punctate; basal joint of hind tarsus subequal to the remainder.

Length, 7.3 mm.; width, 2.8 mm.

St. Louis, Missouri; a single specimen, probably a female, sent by Mr. H. G. Klages, who kindly permits me to retain the type.

This species is most nearly related to *floridanus*, *texensis* and *inopiatus*. From the two first named it differs by its more evenly oval form, more widely distant eyes, somewhat more densely punctured thorax, and in having the second and third antennal joints of equal length. From *inopiatus* it differs similarly in outline, and perceptibly though less conspicuously by its more distant eyes and distinctly denser pronotal punctuation. In size the present species is appreciably larger than any of the other three mentioned. The difference in form while not very conspicuous is quite perceptible to the critical eye.

92. **Hymenorus floridanus** Casey

1891. *Hymenorus floridanus* Casey, Ann. N. Y. Acad. Sci., VI, p. 116. (Coleop. Notices, III).

Of smallish medium size (5.5 to 6.25 mm.), rather broadly oval, slightly wider posteriorly, dark fuscous or piceous brown, antennae and legs bright rufo-ferruginous. Eyes separated by about their own width. Prothorax at base not quite as wide as the base of the elytra, densely punctate, the punctures very narrowly separated at middle and quite in contact at sides. Comb of protarsal claw with about ten teeth in the male and six or seven in the female.

These characters should easily suffice for the separation of *floridanus* from any other Florida species except possibly *inopiatus*, which see for a statement of differences.

All specimens seen by me are from Florida. The species is also credited to Texas but the few examples I have seen from that State appear to be at least racially distinct, and I have tentatively given them specific standing.

93. **Hymenorus texensis** new species

Very nearly allied to *floridanus*, to which it would run in Casey's table and of which it may be merely a race. It differs from *floridanus* in having the head distinctly more finely and less closely punctate, the thorax also more finely punctate though equally densely so, the antennae almost piceous, and the legs dull rufous.

Length, 6 mm.; width, 2.85 mm.

Fedor, Texas. Two examples; sex uncertain but probably females.

94. **Hymenorus heteropygus** new species

Oblong-oval, a little widened posteriorly (at least in the female), moderately convex, piceous brown above, rufo-castaneous beneath, the abdomen darker, legs dark rufous, antennae dusky ferruginous, paler at base; integuments moderately shining, finely alutaceous.

Antennae rather slender, about two-fifths as long as the body, third joint perceptibly longer than the fourth, median joints not quite as long as wide. Eyes (♀) separated by their own width or slightly more.

Prothorax a little less than two-fifths wider than long, widest at base, which is slightly narrower than the base of the elytra, sides moderately arcuately convergent from the base; disk distinctly impressed medially behind the middle; punctuation rather coarse and dense, the punctures nearly in contact laterally but distant by their own diameters or a little less at the middle, interstices perceptibly alutaceous.

Elytra about three times as long and fully two-fifths wider than the thorax, sides feebly arcuate and perceptibly widened posteriorly; striae distinctly impressed and rather closely and strongly punctate; interspaces moderately punctate, shining, very finely and indistinctly alutaceous. Body beneath and legs as in the allied species.

Length (head deflexed), 5.3 to 5.7 mm.; width, 2.4 to 2.55 mm.

Described from two female examples collected at Gainesville, Florida, by Mr. J. S. Rogers. In both specimens the pygidium is distinctly triangularly notched at apex much as in females of *sobrinus* but a little more strongly so, and as in *sobrinus* the notch will probably be found lacking in the males.

This species is nearly related to *floridanus* and *texensis*, agreeing with them in the unusual character of having the third antennal joint longer than the fourth. It is still closer in general aspect to *inopiatus*, in which species however the third and fourth antennal joints are virtually equal, the prothorax is more nearly equal in width to the base of the elytra, and the female lacks the pygidial notch. In *sobrinus* the prothorax is more transverse and the size is appreciably smaller.

95. **Hymenorus inopiatus** new species

Oblong-oval, piceous black, shining, pubescence pale, legs and antennae rufo-ferruginous, the latter often clouded except at base.

Head closely punctate; eyes separated by slightly more than their own width in both sexes. Antennae two-fifths as long as the body, slender, not at all serriform, third and fourth joints equal or very nearly so, intermediate joints just perceptibly obconic and fully twice as long as wide.

Prothorax three-fifths wider than long, sides not quite parallel at base, very nearly continuous with the sides of the elytra; surface densely punctate, the punctures distinctly separated at middle by less than their own diameters; median line broadly vaguely impressed posteriorly.

Elytra three and one-half times as long as the prothorax and about one-fifth wider, widest a little behind the middle; striae moderately impressed, intervals rather sparsely punctate with two or three punctures in the interstitial width.

Propleura completely but not closely punctate; metasternum and abdomen strongly shining, the latter sparsely nearly evenly punctate. Basal joint of hind tarsus equal to the remainder; comb of protarsal claw with about eight teeth in the male and six in the female.

Length, 5.5 to 6.8 mm.; width, 2.3 to 2.8 mm.

Described from a series of fifteen specimens from St. Petersburg, Dunedin, Ormond and Lake Mary, Florida; Savannah and Tybee Island, Georgia. The type is a male from St. Petersburg taken by the writer April 6, 1926.

This species is closely related to *floridanus*, with which it is probably confused in collections. It differs from the latter in its darker more piceous color, in having the prothorax relatively a little wider and more nearly equal in width to the elytral base, and with the disk less densely punctate; the eyes are also more widely distant than their own widths while in *floridanus* they are distant by their own widths or even slightly less. The antennae are a little more slender than in *floridanus* and often inclined to be a little dusky while in the latter they are clear rufoferruginous.

96. **Hymenorus sobrinus** Casey

1891. *Hymenorus sobrinus* Casey, Ann. N. Y. Acad. Sci., VI, p. 115. (Coleop. Notices, III).

This species was described from a unique female from Hillsboro, Florida. Besides the type I have seen a single example (♀) taken by Blatchley at Lakeland, not far from the type locality, and have also from Bischoff and Liebeck a small series of specimens from Anglesea, New Jersey, which appear to be specifically the same.

Sobrinus is smaller (4.8 to 5.2 mm.) than *floridanus* or *inopiatus* but is closely related to these species, more especially the latter. Apart from size however the dark brown or piceous legs and antennae will separate it from either. In the female there is a small notch at the middle of the apical margin of the pygidium; this is lacking in the only two males before me.

97. **Hymenorus uniseriatus** Casey

1891. *Hymenorus uniseriatus* Casey, Ann. N. Y. Acad. Sci., VI, p. 122. (Coleop. Notices, III).

This remarkable species, placed by Casey at the end of his series, was distinguished from all others known to him by the uniseriately punctate elytral interspaces. The eyes are small and separated even more widely on the front than his measurements indicate; the prothorax is more quadrate and the vestiture longer and more bristling than usual; the whole forming a combination quite unique at the time of its description, though now paralleled or even exceeded in some of its peculiar features by the more recently discovered *crinitus* which follows.

The unique type (length 5 mm.) is described from California without specific locality, but without much doubt from the southeastern part of the State.

98. **Hymenorus crinitus** new species

Oblong-oval, moderately elongate, pale rufotestaceous throughout, shining, clothed with long semi-erect to suberect bristling yellow pubescence. Antennae a little less than half the length of the body, third joint just perceptibly longer than the fourth, intermediate joints obconic and more than one-half longer than wide. Head two-thirds as wide as the thorax, rather coarsely closely punctate between the eyes, occiput smoother. Eyes in the female separated by nearly one-half more than their own width.

Prothorax much narrower than the elytra, three-eighths wider than long, sides very faintly curved and just perceptibly convergent from near the rectangular base angles to the apical third, thence more convergent, the front angles rounded; apex three-fourths as wide as the base; punctures very densely placed laterally but separated by about their own diameters along the middle of the disk.

Elytra one-half wider than the thorax and four times as long, about twice as long as wide; striae scarcely at all impressed; strial punctures strong, oblong, close-set; intervals each with a single regular series of much finer punctures.

Prosternum and propleura coarsely closely punctate; ventral segments one to three sparsely evenly punctate, four to five nearly smooth. Legs rather slender; basal joint of hind tarsus equal to the remainder; comb of protarsal claw with five or six teeth.

Length, 6 mm.; width, 2.2 mm.

Ajo, Southern Arizona, (O. C. Poling); a single female specimen.

This species is obviously closely related to *uniseriatus*, in the peculiar features of which it shares. The prothorax is even a little more quadrate and the vestiture is perceptibly longer. The eyes are not quite so widely separated above as in *uniseriatus*, but beneath are very distinctly more remote than in the latter. The third antennal joint is relatively a little longer in the present species.[4]

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[4] Since writing the above several examples including the male have been sent me from the California Academy collection. These bear locality labels Florence, Magna, Tucson and Papago Wells (Yuma Co.), all in Arizona, and were collected by Van Duzee, Martin, and Slevin. The eyes are only slightly less distant in the male and the comb of the protarsal claw in this sex has about eight teeth as compared with six in the female.

99. **Hymenorus liebecki** new species

Narrowly oblong, parallel, dark brown, body beneath and appendages not or but slightly paler; luster dull; pubescence short, semi-erect, obscure in color.

Antennae long, filiform, slightly exceeding half the length of the body, third joint slightly longer than the fourth, median joints very nearly three times as long as wide. Head densely punctate; eyes in the male separated by their own width on the front, a little more distant beneath.

Prothorax subquadrate, only about half as wide as the elytra at middle; three-tenths wider than long, sides straight and parallel from the base for three-fourths of their length, thence rounding to apex, which is nearly four-fifths as wide as the base; surface unimpressed, coarsely and very densely punctate, the punctures everywhere virtually in contact; basal foveae lacking, the median lobe obsolete.

Elytra across the humeri one-half wider and five times as long as the thorax, sides parallel and slightly arcuate for two-thirds their length, thence very gradually narrowed to apex; striae nearly obsolete on basal half of disk, faintly impressed apically and at sides; strial punctures very fine, round, those of the interspaces equally fine on the disk where they are scarcely distinguishable from those of the striae, and toward the apex become even a little larger than those of the striae.

Propleura densely punctate except toward the coxae; ventral segments finely nearly evenly punctate, the fourth and fifth even a little more closely so than the others. Legs slender, basal joint of hind tarsus evidently shorter than the remainder; comb of protarsal claw of the male with about ten teeth.

Length, 8.3 mm.; width, 2.75 mm.

Huachuca Mountains, Arizona. Two males submitted by Mr. Liebeck to whom the paratype is returned.

By its subquadrate thorax this remarkable species can be associated only with *quadricollis*, *crinitus* and *uniseriatus*, but is very distinct from any of these, notably by the dull elytra with the striae only faintly indicated on the disk.

This most interesting species is with pleasure dedicated to my long time friend and correspondent the veteran coleopterist Mr. Chas. Liebeck of Philadelphia, to whom I am indebted for many favors and for many fine species in my cabinet.

100. **Hymenorus quadricollis** new species

Form narrow, subparallel; elytra piceous brown to nearly black, thorax and head dark brown, body beneath and antennae a little paler, legs rufo-ferruginous; integuments shining, the thorax less so from the density of the punctuation; pubescence sparse, inclined, fuscous.

Head only slightly narrower than the prothorax, eyes rather large and prominent, separated above by about one-fifth more than their own width and beneath by very nearly their own width; punctuation close. Antennae a little longer than half the body, attaining the middle of the elytra, filiform, moderately slender, median joints more than twice as long as wide, very feebly obconic, third and fourth joints subequal.

Prothorax subquadrate, much narrower than the elytra, fully four-fifths as long as wide, widest at or a little before the middle, sides broadly arcuate and a little convergent in front, very slightly converging and subsinuate behind, front angles distinct, moderately obtuse, hind angles sharp, very slightly obtuse; punctuation dense and rather coarse, the punctures almost or quite in contact throughout.

Elytra three-fifths wider and four and one-half times as long as the thorax, a little more than twice as long as wide, sides nearly straight and parallel in basal two-thirds; striae all distinctly impressed throughout their length; strial punctures close-set and equal in size to the sparse punctures of the interspaces which occasionally are arranged in a nearly regular single series, but more often are more or less irregularly disposed.

Prosternum and propleura rather coarsely not densely punctate, the punctures separated by their own diameters as a rule, the interspaces shining. Mesocoxae separated by twice the width of the prosternal process. Ventral segments sparsely punctate, the fourth and fifth not noticeably more sparsely or finely than the first three. Basal joint of hind tarsus a little shorter than the remainder; comb of protarsal claw in the male with seven or eight teeth.

Length, 6–6.7 mm.; width, 2–2.35 mm.

Alpine, Texas, May–Aug., (O. C. Poling, collector), six examples. The type is a male, and I am not sure that the female is present in the series before me, at least there is no appreciable difference observable in the eyes or antennae.

This remarkable species differs notably in several respects from the conventional *Hymenorus*, yet it seems to possess all the essential features of the genus. Its most obvious peculiarity is the relatively small subquadrate prothorax, which however it

must in some degree share with the three preceding species. Equally exceptional are the eyes less widely separated on the lower surface of the head than above, the relatively wide mesocoxal process and the similarity of the punctuation of the fourth and fifth ventral segments to that of segments one to three. There is nothing in the description to indicate whether *uniseriatus* possesses any of these characters, but I have recently learned from Mr. Buchanan, who has kindly examined the type of *uniseriatus*, that the eyes are just measurably less distant beneath than above, while the fourth and fifth ventral segments are noticeably more sparsely punctate as is usual in the genus. Among other characters *uniseriatus* differs from the present species in its rather sparsely punctate pronotum, very densely punctate prosternum, single series of punctures on each elytral interval, and its pale flavo-testaceous color.

The fact that the prothorax is just perceptibly wider at middle than at base suggests the possibility that this species might more appropriately be referred to *Telesecles*. It however does not much resemble *T. cordatus*, our only species of the genus, in which the thorax is strongly rounded on the sides and much narrowed at base, and I prefer to leave it in *Hymenorus*.

HESPERIIDAE OF THE FORBES EXPEDITION TO DUTCH AND BRITISH GUIANA

(LEPIDOPTERA)

BY ROSWELL C. WILLIAMS, JR. AND ERNEST L. BELL

(Colored plate XXV and text figures)

The Hesperiidae listed in this paper were collected by Dr. W. T. M. Forbes and his associate, Dr. P. P. Babiy, on what is known as the Forbes 1927 Expedition to the Guianas.

This expedition was organized by Messrs. Frank Johnson, W. F. Lawler, Jr., W. J. Coxey, Bell, Williams and others and was financed by the above gentlemen and Dr. Forbes himself. The Hesperiidae collected were all sent to the writers of this paper and were distributed in the collections of the Academy of Natural Sciences of Philadelphia and of Mr. Bell; all types being deposited in the Academy's collection. Dr. Forbes' field notes are filed in the Entomological Department of the Academy (and at Cornell University at Ithaca, New York) and the following notes applying to the Hesperiidae are taken from this record.

March 24, 1927, Dr. Forbes arrived at St. Thomas in the evening; thence to Fredericksted, St. Croix, V. I.

March 25, (full dry season), Basseterre.

March 26, thence to St. Kitts, there collecting mainly on the slopes of Monkey Hill and on cultivated ground in the vicinity of the town.

March 28, Pointe a Pitre, Guadeloupe, cultivated lowland and pasture.

March 29, Kingston, St. Vincent, in and about the Botanical Garden.

March 30, Bridgetown, Barbados, quarry and fields near the town, very dry season.

April 3rd, Dr. Forbes arrives in Paramaribo, Dutch Guiana (Surinam). There he collected in several localities near the town and down the Surinam River below the city, showers for the first time on April 7th.

April 8, Ongelijk; a bauxite mine on the Para River.

April 9, Paramaribo; the agricultural station in an area of practically undisturbed wet forest.

April 10, five miles down the river.

April 11, Sint Barbara Plantation in the fork of the Surinam and Surnau Rivers; a cocoa and coffee plantation.

April 18, From Paramaribo south along the railroad to Saron. The Pyrrhopyge found on pink and yellow flowered shrubs, mostly on a single cluster.

April 19, Zanderij; 44 K.M. south of Paramaribo near Coropine Kriek, collecting near the Forest Agricultural Station, both in sand barren and forest country.

April 28, Paramaribo in the vicinity of Saron.

April 30, Ongelijk again.

May 4, Paramaribo again; rainy season well underway, and butterflies scarce.

May 6, Moengo; the bauxite mine of the Surinaamsche Bauxite mine Mtsy. On the Upper Cottica River about 5 miles above the Bush negro village of Rikanau at the mouth of Moengo Creek. Rainy season, grass, bush, and some forest. *Pyrgus orcus*, and other butterflies between showers and even in light rain.

June 1, Paramaribo again, mostly around the Agricultural Experiment Station.

June 7, Kwakoegron, a point where the railroad meets the Saramacca River, the railroad and police headquarters for the gold fields. Rich vegetation and collecting in the clearings and about swampy land and particularly on Maabo Hill.

June 19, Georgetown, British Guiana in the Botanical Gardens.

June 21, Mackenzie, the bauxite mine on the Demerara River opposite Wismar, a settled area with lawns, palms, and shade trees, surrounded with forest.

June 23, Three Brothers Mine 8 miles south of Mackenzie on the Demerara River.

June 24, Mackenzie again.

June 25, Rockstone on the Essequebo River and vicinity.

June 27, Tumatumari on the first rapids of the Potaro River, collecting in clearing of an ancient forest and along the Tiger Creek Trail.

June 30, Rockstone again.

July 10, St. Ann, Port of Spain, Trinidad. Up the valley to near its head.

July 11, St. Augustine, a few miles to the east and at various roadside points between Arima and the Caroni River.

July 12, St. Clair, Port of Spain, including the hills behind Botanical Garden and roads between.

July 13, Grenada, British West Indies, hillside near the village.

We give colored figures of the new species, and drawings of the male genitalia of most of the species that have not been previously figured.

List of Species Taken

Pyrrhopyge amyclas (Cramer)

Paramaribo, Dutch Guiana, April 9, 1♂.

Taken in the hotel room.

Pyrrhopyge phidias (Linnaeus)

Zanderij Island, Boven, Para District, Dutch Guiana, April 20, 3♂, 1♀.

Mysoria barcastus (Sepp)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♀. Paramaribo, Dutch Guiana, April 18–28, 7♂, 3♀. Moengo Boven, Cottica River, Dutch Guiana, May 15, 1♂. Kwakoegron, Saramacca River, Dutch Guiana, June 10–14, 7♂.

Phocides palemon (Cramer) ab. **gunderi** new aberration

Rockstone, Essequebo River, British Guiana, June 30, 1♂.

This insect differs from typical *palemon* in that the red spots on the costa of the superior wings are absent, this space occupied by rather darker scales than the ground color, also there is less orange red on the anal angle of the inferior wings, especially beneath, and the white border of these wings is rather broader and not so sharply defined, the veins running down into it.

The male genitalia of this insect are the same as those of *palemon* and this leads us to believe that this unique individual is an aberration and not a new species or form.

Mabille and Boullet[1] have given the name *unimaculata* to a variety with a single red spot on the costa instead of the usual two. This one we name for Mr. Jeane D. Gunder, who has contributed so much to our knowledge of aberrational forms.

Tarsoctenus papias (Hewitson)

Moengo Boven, Cottica River, Dutch Guiana, May 24, 1♀.

Eudamus albimargo (Mabille)

Moengo Boven, Cottica River, Dutch Guiana, May 16, 1♀. Kwakoegron, Saramacca River, Dutch Guiana, June 8–11, 2♂, 1♀.

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[1] Ann. Soc. Nat. Zool., Paris, xvi, p. 18, 1912.

Eudamus dorantes (Stoll)

Paramaribo, Dutch Guiana, April 28, 1♀. Kwakoegron, Saramacca River, Dutch Guiana, June 8–14, 2♂, 4♀.

Eudamus dorantes race **parvus** Skinner

Basseterre, St. Kitts, British West Indies, March 26, 4♂, 1♀. Grenada, British West Indies, July 13, 1♂.

These have three apical dots, the second discal dot and an extra-discal dot only. The type of *parvus* from St. Pierre, Martinique, is immaculate but the paratypes show some hyaline dots, so this character is variable. In other respects, the St. Kitts insects are like those from Martinique.

Eudamus doryssus Swainson

Zanderij Island, Boven, Para District, Dutch Guiana, April 24–27, 2♀.

Eudamus orion (Cramer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14, 1♂, April 12, 1♀.

Eudamus proteus (Linnaeus)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 16, 2♂. Kwakoegron, Saramacca River, Dutch Guiana, June 7, 1♀, June 14, 1♂, July 12, 1♀.

Basseterre, St. Kitts, British West Indies, March 26, 1♂. Grenada, British West Indies, July 13, 1♂ aberration?

This has two small apical dashes and a third dot further removed. There are two dots at the point occupied by the extra medial spot in the typical *proteus* but no other hyaline spots. The ground color is slightly darker at the points occupied by the hyaline spots in typical *proteus*, but in other respects like *proteus*.

The male genitalia agree with those of typical *proteus*.

Goniurus eurycles (Latreille)

Paramaribo, Dutch Guiana, April 10, 1♂, April 6, 1♀, April 18, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–12, 2♂, 2♀.

Port of Spain, Trinidad, July 12, 1♂, 1♀.

Goniurus simplicius (Stoll)

Paramaribo, Dutch Guiana, April 18, 2♂, 2♀. Kwakoegron, Saramacca River, Dutch Guiana, April 15, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♂.

Port of Spain, Trinidad, July 10–12, 1♂, 2♀.

Chioides catillus (Cramer)

Kwakoegron, Saramacca River, Dutch Guiana, June 15, 1♂. Paramaribo, Dutch Guiana, April 18, 1♀. Ongelijk, Para River, Dutch Guiana, August 8, 1♀, and 1♂ aberration.

In the above aberration the hyaline spots are absent with the exception of the three apical ones. Below, the markings are more suffused, the darker spots fusing into the ground color, giving a darker appearance than is typical.

Grenada, British West Indies, July 13, 1♂ aberration.

This is much smaller than typical *catillus*, the secondaries more rounded and the tails shorter. The primaries have the three apical dots and the extra discal spot only. Below the purplish brown much more suffused and not contrasting as in typical *catillus*. We are inclined to think this Grenada specimen may represent a race of *catillus* which is to *catillus* what *parvus* is to *dorantes*. The male genitalia of both of these aberrations are the same as those of *catillus*.

Aguna ganna (Moschler)

Kwakoegron, Saramacca River, Dutch Guiana, June 11, 1♀.

Epargyreus exadeus (Cramer)

Port of Spain, Trinidad, July 12, 1♂.

Telegonus fulgerator (Walsh)

Zanderij Island, Boven, Para District, Dutch Guiana, April 25, 1♂.

Telegonus pervivax (Hübner)

Sint Barbara Plantation, Surinam River, Dutch Guiana, 1♀.

Telegonus creteus (Cramer)

Georgetown, British Guiana, June 22, 1♀.

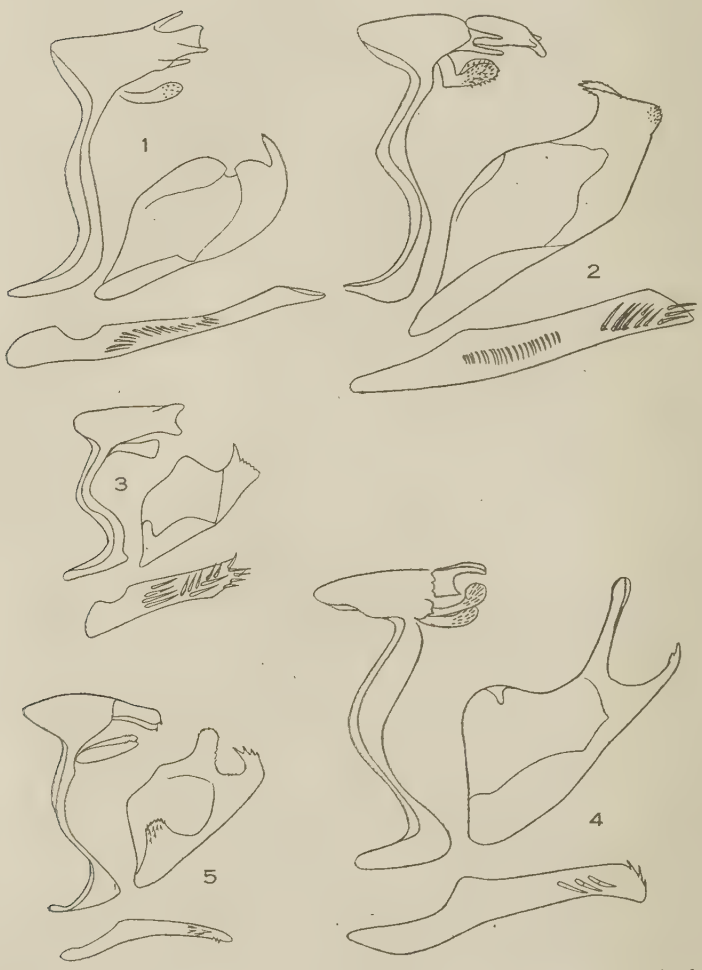

Fig. 1. *Telemiades amphion* Geyer. 2. *Telemiades ceramina* Herrich-Schaeffer. 3. *Cogia freudiae* new species. 4. *Lignyostola crinisus* Cramer. 5. *Hyalothyrus nitocris* Cramer.

Telegonus alardus (Stoll) form **latimargo** Herrich-Schaeffer

Paramaribo, Dutch Guiana, April 5–12, 3♂. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14, 1♀.

Dr. Forbes reports finding these resting on the underside of leaves.

The male genitalia are the same as those of *alardus* Stoll. The girdle is typical of the species, the scaphium with small serrations on the dorsal edges. The clasp ends in a point and the internal dorsal projection carries a number of stout spines. The aedoeagus is provided on the dorsal central portion with many small fine teeth and there is an internal bunch of seven or eight slender spines about half the length of the aedoeagus.

Latimargo seems to differ from *alardus* only in the absence of white on the margin of the upper wings below. We are inclined to believe it to be only a varietal form.

Telemiades amphion (Geyer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 12, 1♀. Kwakoegron, Saramacca River, Dutch Guiana, June 8-14, 2♂.

Male genitalia (Fig. 1). The uncus ends in a rather broad snout at the base of which there are two shorter projections, one on each side. The split halves of the scaphium are covered externally with small projecting teeth set closely together. The clasp ends in an upturned, rather sharp projection carrying a few teeth. The aedoeagus carries internally a long row of about forty parallel short spines.

Telemiades avitus (Cramer)

Zanderij Island, Boven, Para District, Surinam, April 25, 1♂.

Telemiades ceramina Herrich-Schaeffer

Zanderij Island, Boven, Para District, Dutch Guiana, April 27, 1♂.

Georgetown, British Guiana, June 24, 1♀.

Male genitalia (Fig. 2). The uncus ends in a turned down snout with two ears, one on each side, somewhat within. At the base and separated from the uncus proper, there are four projections, two on each side. The scaphium is strong and

covered with small teeth. The valve has a truncate terminus with a spatulate upturned projection strongly toothed, as is the exterior margin. The aedoeagus carries two groups of internal spines, a long central row of slender ones and an outward bunch of larger ones.

Cecropterus aunus (Fabricius)

Kwakoegron, Saramacca River, Dutch Guiana, June 8–15, 1♂, 3♀. Moengo Boven, Cottica River, Dutch Guiana, May 23, 1♀.

Cecropterus neis (Geyer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 16, 1♀.

Cecropterus capys Godman and Salvin

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 16, 1♂.

Cecropterus bocus Plotz

Kwakoegron, Saramacca River, Dutch Guiana, May 21, 1♂. Zanderij Island, Boven, Para District, Dutch Guiana, April 24, 1♂.

Bungalotis midas (Cramer)

Tumatumari, Potaro River, British Guiana, June 24, 1♂ (found dead at light), June 24, 1♀ (taken at light).

Cogia calchas (Herrich-Schaeffer)

Port of Spain, Trinidad, July 12, 3♂, 4♀.

Cogia freudiae new species (Pl. I, fig. 11, ♂.)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 3♂.

This striking new species is nearly related to *hassan* Butler.

♂. Wings above uniformly chestnut brown, with considerable sheen. The apex of the primaries with a slight pinkish tinge and the base and the distal and hind margin of both wings with a somewhat greenish reflection due to olive scales and hairs. Two faintly indicated lighter dots on the costa towards the apex. Fringes brown, cut between the veins with lighter scales. On the hind wing in the anal fold there is a tuft of whitish hairs almost the length of the wing. These are capable of extension at right angles to the wing in a tuft.

Primary wings below of the same color, lighter, becoming buff at the inner margin. Three minute whitish dots on the costa beyond the middle, opposite the two above, the third being just below these; an indistinct row of lighter spots before the outer margin, which is slightly darkened; fringes brown, cut with lighter as above. Hind wing chestnut brown with lighter markings; a few at the base, an irregular broken row across the disc, and an irregular broken band before the margin; fringes brown, cut with somewhat lighter color. Body brown above, lighter below. Palpi dark gray above, ash white below. Antennae black, ringed with white below; club dark above, whitish below; apiculus reddish. Expanse 24 mm.

Male genitalia (Fig. 3). They are very similar to those of *hassan*. The uncus ends in a bi-lobed, truncate snout, shown flattened in the drawing; the scaphium is simple and smooth; the valve is rectangular at its terminus with a strong upturned dorsal tooth and dentate external border. There is a short lobe at the base of the ventral plate. The aedoeagus carries a large number of rather strong spines.

Type —♂, with one paratype are in the collection of the Academy of Natural Sciences of Philadelphia; and one paratype in the Bell collection. Named for Mrs. Williams.

Spathilepia clonius (Cramer)

Kwakoegron, Saramacca River, Dutch Guiana, June 8, 1♂, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♀.

Lignyostola crinisus (Cramer)

Moengo Boven, Cottica River, Dutch Guiana, May 19, 1♂.

Male genitalia (Fig. 4). The uncus has two short curved fingers; the scaphium is double with rounded termini provided with short pin-like spines rather evenly disposed. The aedoeagus carries three floating spines and its terminus above has some recurved teeth.

Hyalothyrus nitocris (Cramer)

Zanderij Island, Boven, Para District, Dutch Guiana, April 24, 1♂. Tumatumari, Potaro River, British Guiana, June 28, 1♂.

Male genitalia (Fig. 5). The uncus has two bulbous projections each tipped with a small tooth. The valve ends in two projections, the lower turned upward and provided externally with strong teeth, the upper one rounded; the ventral plate is

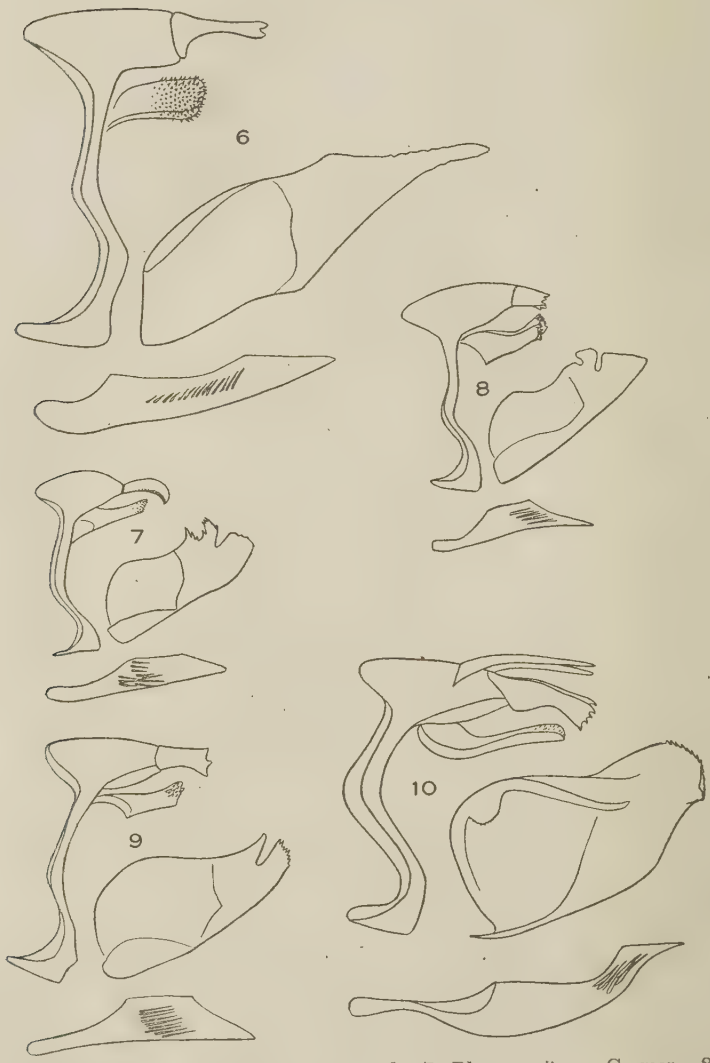

Fig. 6. *Grynopsis coeleste* Westwood. 7. *Phanus vitreus* Cramer. 8. *Phanus godmani* new species. 9. *Phanus marshalli* Kirby. 10. *Entheus priassus* Linnaeus.

well developed and provided on its inner margin with teeth. The aedoeagus is simple but provided at its external ventral extremity with a few teeth.

Grynopsis coeleste (Westwood)

Zanderij Island, Boven, Para District, Dutch Guiana, April 22, 1 ♀.

Male genitalia (Fig. 6). The uncus ends in a long narrow projection split at the extremity. The scaphium is large, strong and covered externally with small denticulations. The valve ends in a long finger, somewhat roughened externally, otherwise it is simple; the aedoeagus carries a row of short strong spines.

Phanus vitreus (Cramer)

Moengo Boven, Cottica River, Dutch Guiana, May 19, 1 ♂. Zanderij Island, Boven, Para District, Dutch Guiana, May 25, 1 ♀, April 16, 1 ♀.

Godman and Salvin in the Biologia believed the various forms of which *vitreus* is typical to be but one and the same species. What we believe to be true *vitreus* Cramer, and which compares well with Cramer's figure, we have from the localities in Surinam given above. The male genitalia (Fig. 7) differ from those figured by Godman and Salvin in the shape of the uncus, and also in the valvae which, in addition to the two projections at the extremity, have a strong tooth beyond these placed dorsally, which is absent in the Godman and Salvin figure.

The male genitalia of *marshalli* also differ from those of *vitreus* more than we believe possible in a single species. Besides this, we have other forms of genitalia which are duplicated at rather distant points geographically, so we have come to the conclusion that there are in this genus a number of distinct species clearly separated by the form of the male genitalia though superficially very much alike in maculation. Cramer's *vitreus* is undoubtedly the insect we have from Surinam, the male genitalia of which we figure herewith. As to the insect, the male genitalia of which are figured as *vitreus* by Godman and Salvin, the text leads us to believe that it came from Nicaragua. We have insects from Costa Rica also whose genitalia agree with the figure and we propose for them the name *godmani*.[2]

[2] For the description of this species see page 286.

Phanus marshalli (Kirby)

Georgetown, British Guiana, June 24, 1♂.

This insect agrees very well with the figure of *marshalli* and as the male genitalia (Fig. 9) are very different from those of *vitreus* we must consider it a distinct species. We have an individual with similar genitalia from Porto Cabello, Venezuela (Klages), so the insect originally described from Trinidad may have a wide distribution and can easily occur in the Guianas.

Entheus priassus (Linnaeus)

Moengo Boven, Cottica River, Dutch Guiana, May 18–21, 4♂.
Tumatumari, Potaro River, British Guiana, June 29, 2♂.

Male genitalia (Fig. 10). The uncus is bifid and with strong claw like terminals. The tegmen has at the terminal, projecting over the uncus, a pair of long slender fingers. The well developed scaphium is provided with strong denticulations on the outer portion. The simple valvae end in a rounded cuiller with teeth externally. From the base there is a long curved slender style three-fourths the length of the valve. The curved, stout, aedoeagus carries about ten strong spines.

Entheus gentius (Cramer)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 3♂. Kwakoegron, Saramacca River, Dutch Guiana, June 15, 1♂.

Male genitalia (Fig. 11). They are very similar to those of *priassus*, differing only in the stronger teeth of the cuiller, smaller number of thorns in the aedoeagus, and minor features as shown in the figures.

Entheus mina new species (Pl. I, fig. 5, ♂, fig. 6, ♀.)

Zanderij Island, Boven, Para District, Dutch Guiana, April 13, 1♂, 1♀.

A single pair of this beautiful new species was taken by Mr. Forbes.

♂. Upper wings brown on the outer portion and costa, orange at the base in a triangle extending almost to the inner angle. A row of six subapical white hyaline spots, occupying the upper interspaces, the first four rectangular, the fifth excavated internally and the sixth rectangular, narrow. A discal row of

three, the first and second in the cell and the interspace below large and irregularly rectangular, the third a small rectangle below the outer portion of the one above, another larger rhomboid spot in the fifth interspace, midway between the apical and the distal rows. The secondary wings have the entire basal and median portion orange, the costal margin broadly brown and the outer margin narrowly brown. There is a splash of brown hairs also at about the center of the disc. There is the usual broad costal fold on the primaries. Fringes concolorous brown.

Wings below with the same markings, the brown somewhat lighter and the orange very much lighter. Below the distal band there are some light yellow marks. The orange of the secondaries is not clouded below with brown centrally as it is above. Body above orange, below lighter yellow. Head above has two white tufts at the eyes and three before the palpi. Palpi brown above, white below. Antennae brown, yellowish beneath the long sickle shaped club. Expanse 35 mm.

♀. The female differs as strikingly from the male as is the case in the other species of this genus. The upper wings are uniformly brown except for a short ray of orange from the base into the cell. Apical and sub-apical spots as in the male; the distal row somewhat smaller and more separated by the veins; an additional small triangular spot in the second interspace.

The lower wings brown with a large white spot on the disc extending from the inner margin into the wing, rounded outwardly, and occupying about one-half the wing area. Wings below somewhat lighter brown, with the same markings, and in addition, on the upper wing, above the orange ray, a splash of brighter yellow between the ray and the costa, and a dash of white on the inner margin from the last spot inwardly to the base.

Body above, brown with some olive hairs, whitish below. Expanse 35 mm.

Type.—(♂) and allotype (♀). These are in the collection of the Academy of Natural Sciences in Philadelphia. Named for Mrs. Bell.

Male genitalia (Fig. 12). The uncus has two parts, one spatulate lobe, not very strong, and another with two spatulate ends much stronger and shown in the drawing flattened out. The scaphium is a wide girdle, the outer portion strongly covered with reticulations. The valve is simple, the exterior margin strongly toothed; at the internal upper margin there is a short spatulate projection. The large aedoeagus carries a number of large strong spines.

Fig. 11. *Entheus gentius* Cramer. 12. *Entheus mina* new species. 13. *Pythonides jovianus* Cramer. 14. *Pythonides lerina* Hewitson. 15. *Achlyodes busirus* Cramer. 16. *Gorgythion begga* Prittwitz.

Celaenorrhinus eligius (Cramer)

Moengo Boven, Cottica River, Dutch Guiana, May 19, 1♀.

Quadrus cerialis (Cramer)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 12–16, 2♀.

Quadrus lugubris (Felder)

Port of Spain, Trinidad, July 10, 12, 2♀.

These individuals and others we have from Trinidad are smaller, darker, and have the lower wings somewhat more rounded than that of the Godman and Salvin figure in the Biologia, which is presumably a Mexican insect. The male genitalia of the Trinidad insect are the same excepting the valvae, the extremities of which are more slender in the Trinidad form. They are undoubtedly the same species and as the species varies considerably we hesitate to propose a racial name, or apply any of the four names placed in the synonymy by Godman and Salvin, namely, *ophia* Butler from Venezuela, *sephara* Hewitson from Brazil, *cobarus* Moschler from Colombia, and *ambla* Plotz from South America.

Pythonides jovianus (Cramer)

Kwakoegron, Saramacca River, Dutch Guiana, June 8, 1♀. Zanderij Island, Boven, Para District, Dutch Guiana, April 19–20, 2♂.

Male genitalia (Fig. 13). The uncus is shaped like a beak, and not split; the scaphium or 10th sternite appears as a simple leaf like fold; the saccus is rather long. The valvae are simple, the outer edge of the cuiller provided with small spines. The aedoeagus is also simple, the internal portion long and slender to correspond with the saccus.

Pythonides lerina (Hewitson)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 1♂. Moengo Boven, Cottica River, Dutch Guiana, May 19, 1♀.

Tumatumari, Potaro River, British Guiana, June 28–29, 2♂. Mackenzie, Demarara River, British Guiana, June 24, 1♀.

Male genitalia (Fig. 14). They are very close to those of *jovianus*, only somewhat smaller in size as might be expected.

Pellicia bromias Godman and Salvin

Paramaribo, Dutch Guiana, April 10, 2♂, 1♀; April 18, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–16, 2♂, 3♀. Kwakoegron, Saramacca River, Dutch Guiana, June 12, 1♀.

Pellicia ephora Herrich-Schaeffer

Port of Spain, Trinidad, July 22, 1♂.

Pellicia macarius Herrich-Schaeffer

Kwakoegron, Saramacca River, Dutch Guiana, June 12–14, 2♂, 5♀. Paramaribo, Dutch Guiana, April 18, 1♂, 2♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 16, 1♀.

Anastrus petius (Moschler)

Tumatumari, Potaro River, British Guiana, June 28, 1♂.

Eudamidas jason (Ehrmann)

Kwakoegron, Saramacca River, Dutch Guiana, June 13, 1♀. Port of Spain, Trinidad, August 12, 1♂.

Xenophanes tryxus (Cramer)

Kwakoegron, Saramacca River, Dutch Guiana, June 1, 1♂; June 11, 2♂. Paramaribo, Dutch Guiana, April 9, 1♂. Moengo Boven, Cottica River, Dutch Guiana, May 14, 1♂.

Tumatumari, Potaro River, British Guiana, June 29, 1♀.

Ouleus fridericus (Geyer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 15–16, 3♂, 2♀. Paramaribo, Dutch Guiana, May 4, 1♂; June 1, 1♂. Kwakoegron, Saramacca River, Dutch Guiana, June 15, 1♂.

Port of Spain, Trinidad, July 12, 1♂.

The examples are rather small but typical of *fridericus* in that the secondaries below are dark and without the bluish white that appears on some forms from other localities.

Godman and Salvin in the Biologia state that the typical form has a white patch on the underside of the secondaries, but the figure in Hübner does not show it.

Eantis thraso (Hubner)

Kwakoegron, Saramacca River, Dutch Guiana, June 8–15, 3♀.

Achlyodes busirus (Cramer) form **negro** Kaye

Port of Spain, Trinidad, July 12, 1♂.

This is smaller and darker than typical *busirus*, being almost black and with the bands just indicated; below there is no orange whatever, the secondaries being almost uniformly black. It may be a race. We believe this is the *negro* of Kaye.[3] He gives no one as authority for the name but his brief remarks are quite sufficient to constitute a description.

Male genitalia (Fig. 15). They are peculiar in that the valvae are asymmetrical, as in allied genera. The uncus is not split and ends in a snout like projection. The well developed tegmen has, at its junction with the uncus, two projecting ears. The scaphium or tenth sternite has a rather slender turned up terminal. The valvae end in a cuiller with rather numerous and strong teeth, differing somewhat in the two, and there is another striking difference in that the right valve is furnished at the extremity of the harpe with a rounded, toothed antistyle; in the left valve this feature being smooth, narrower and much more projecting. The aedoeagus is provided just beyond its middle with a projecting finger almost reaching the extremity. It ends in two projections, the left one smooth, the right one papillate; the sheath is a simple band.

Timochares trifasciata (Hewitson)

Port of Spain, Trinidad, July 12, 1♂.

Helias phalaenoides (Hübner)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 13, 2♀. Kwakoegron, Saramacca River, Dutch Guiana, June 12–14, 4♂. Zanderij Island, Boven, Para District, Dutch Guiana, April 19, 1♀.

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[3] Mem. Dept. Agr. Trinidad and Tobago, No. 2, p. 130, 1921.

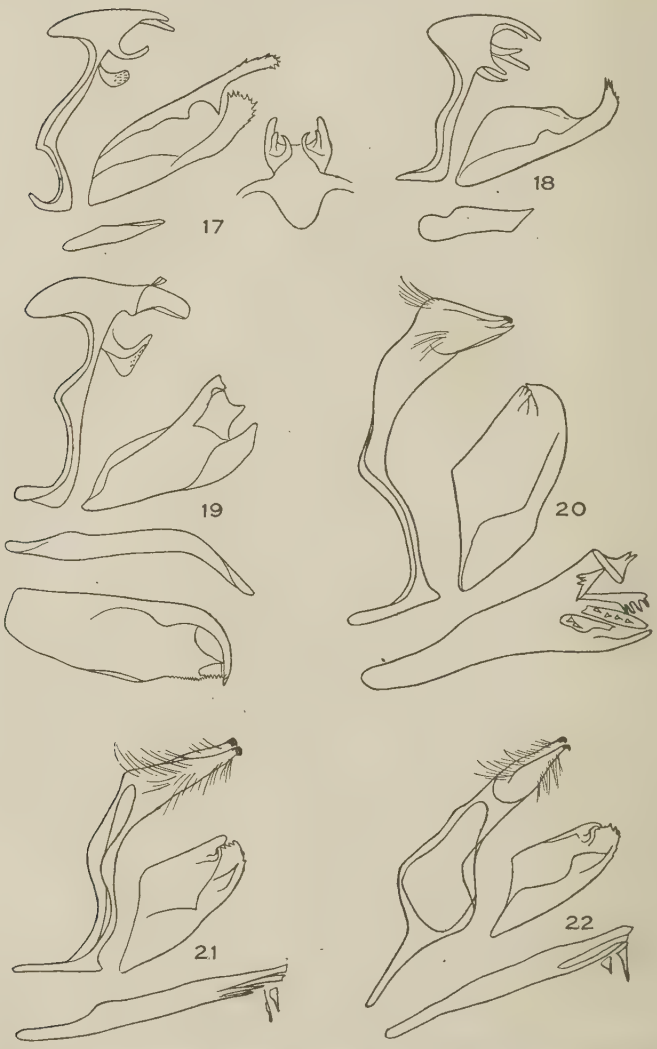


Fig. 17. *Paramimus scurra* Hubner. 18. *Charidia lucaria* Hewitson. 19. *Chiomara punctum* Mabille. 20. *Polites dictynna* Godman and Salvin. 21. *Catia ophites* Mabille. 22. *Catia vesuria* Plotz.

Gorgythion begga (Prittwitz)

Port of Spain, Trinidad, July 10, 1♀.

Male genitalia (Fig. 16). They are rather complicated in that the valvae are asymmetrical. The uncus is a stout snout; the scaphium or tenth sternite, well attached to the uncus, has a pair of turned up serrated lobes; the tegmen is short but rather wide. The right valve, much simpler than the left, is provided with a strongly haired projection at the base of the ventral plate. The left valve is quite complicated; it ends in a strong toothed hand, with another midway of its length projecting inwardly. Above is a denticulated rounded lobe. At about the center of the ventral plate there is another inwardly projecting arm, the outer margin of which is provided with dense short hairs. Besides this there is the basal projection, connected with the base of the ventral plate and provided at its extremity with a tuft of long strong hairs, this process however differing in shape from that of the right valve. The aedoeagus is slender and simple.

Gorgythion begga form **pyralina** (Moschler)

Paramaribo, Dutch Guiana, May 11, 2♂, June 1, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 13, 1♂. Kwakoegron, Saramacca River, Dutch Guiana, June 11, 1♂. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♂.

Georgetown, British Guiana, June 22, 1♂. Mackenzie, Demerara River, British Guiana, June 22, 1♂.

Port of Spain, Trinidad, July 10, 1♂.

Paramimus scurra (Hübner) form **evanescens** Mabille and Boullet

Paramaribo, Dutch Guiana, April 24, 1♂.

Tumatumari, Potaro River, British Guiana, June 28, 1♂.

The spots on the primaries very much reduced.

Male genitalia (Fig. 17). The male genitalia of *scurra* are peculiar in that the uncus ends in three pairs of hooks, each pair widely divergent, a pair above with an excavation between them, at the base of these hooks another pair almost as large, and from the base of the uncus a third pair of more slender hooks turned upward and inward. The tegmen is narrow but rounded inwardly, the girdle and saccus slender. The valve ends in a

rather long arm, the cuiller, bearing outwardly projecting spines; the harpe ends in a truncate projection also bearing dorsal and external spines. The aedoeagus is slender and simple. A specimen of *scurra* from Brazil does not differ genitalically from those of the forms *leucodesma* and *evanescens*.

Paramimus scurra form **leucodesma** (Erichson)

Zanderij Island, Boven, Para District, Dutch Guiana, April 12–23, 4♂, 3♀.

Tumatumari, Potaro River, British Guiana, June 28–29, 2♂, 1♀. Mackenzie, Demerara River, British Guiana, June 22, 1♀.

Lacks the red spots on primaries above.

Charidia lucaria (Hewitson)

Zanderij Island, Boven, Para District, Dutch Guiana, April 22, 1♂.

Male genitalia (Fig. 18). The uncus is very similar to that of *Paramimus scurra* in that there are six projections, three on each side rather widely separated. The valve is, however, rather more simple, the cuiller consisting of an upturned projection strongly toothed at the extremity and dentate outwardly; the harpe is simple without projections. The aedoeagus does not carry floating spines.

Chiomara asychis (Fabricius)

Paramaribo, Dutch Guiana, April 10, 2♂, April 28, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♂; April 16, 1♀.

Chiomara punctum (Mabille)

Zanderij Island, Boven, Para District, Dutch Guiana, April 17–19, 2♂.

Male genitalia (Fig. 19). The uncus is rounded at its extremity, on each side of which at the base there are some convolutions and short ear like points. The girdle extends over the top of the tegmen and the left side is very wide as in *asychis* and species of allied genera. The valvae are asymmetrical. The right valve ends in a sickle shaped cuiller with some teeth towards its extremity, the harpe ending in a rather narrow tongue with small teeth on the external border. The left valve is very different, narrow at the base and with a broad terminus

with three projections. The aedoeagus is simple, curved downward at its outer end.

Heliopetes arsalte (Linnaeus)

Paramaribo, Dutch Guiana, April 4–6, 3♂, 2♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♂, 1♀.

Heliopetes arsalte form **petrus** (Hübner)

Port of Spain, Trinidad, July 12, 1♂.

Erynnis gesta (Herrich-Schaeffer)

St. Augustine to Caroni River, Trinidad, July 13, 1♀. Port of Spain, Trinidad, July 12, 1♂.

Pyrgus syrichtus (Fabricius)

Fredericksted, St. Croix, Virgin Islands, March 25, 3♂, 1♀.
Basseterre, St. Kitts, British West Indies, March 25–26, 4♂.

Pyrgus orcus (Cramer)

Paramaribo, Dutch Guiana, April 3, 1♂, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 12–16, 12♂, 7♀.
Port of Spain, Trinidad, July 10–12, 4♂, 3♀.

Apaustus menes (Cramer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 1♂, 1♀.

Hylephila phylaeus (Drury)

Kwakoegron, Saramacca River, Dutch Guiana, June 12, 1♂.
Basseterre, St. Kitts, British West Indies, March 26, 1♂, 3♀.
Pointe à Pitre, Guadeloupe, March 28, 4♂, 2♀.
Fredericksted, St. Croix, Virgin Islands, March 25, 1♂.

Polites athenion (Hübner)

Paramaribo, Dutch Guiana, April 6–28, 3♂, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 19, 2♂.
Georgetown, British Guiana, June 24, 2♂, 1♀.

Polites dictynna (Godman and Salvin) (Pl. I, fig. 1, ♂.)

Grenada, British West Indies, July 12–13, 2♂.

We are placing *dictynna* in the genus *Polites* as suggested by Lindsey on account of its long oblique stigma on the forewing

of the male, surrounded with black modified scales, prevailing in that genus.

Male genitalia (Fig. 20). They agree very well with those of the other species of the genus. The scaphium is absent. The aedoeagus is provided at its extremity with five stout and strong complicated toothed projections.

Polites vibex (Geyer)

Paramaribo, Dutch Guiana, April 18, 2 ♀.
Port of Spain, Trinidad, July 12, 4 ♂.

Catia ophites (Mabille)

Basseterre, St. Kitts, British West Indies, March 26, 1 ♂.
Pointe à Pitre, Guadeloupe, March 28, 1 ♂.

Male genitalia (Fig. 21). The male genitalia of the species of the genus *Catia* we have examined are very similar, the principal differences showing in the shape of the outer portion of the clasp (the cuiller) and the extremity of the aedoeagus and the projecting thorns, found outside of the chitinous tube, though attached by membrane. The bifid uncus ends in strong claw like hooks, the base rather hairy; the tegmen is narrow and there is no chitinous scaphium (tenth sternite). In the valvae, the ventral portion and the harpe end in sinuous and serrated projections which meet and which differ somewhat in *otho, ophites* and *vesuria*. The aedoeagus ends in two somewhat spatulate projections beyond which are two floating strong teeth, these also differing in shape in the three species mentioned above. The aedoeagus sheath is a rather simple ring.

Catia otho (Smith and Abbot)

Paramaribo, Dutch Guiana, April 14, 1 ♂, 1 ♀. Zanderij Island, Boven, Para District, Dutch Guiana, April 24, 1 ♂. Kwakoegron, Saramacca River, Dutch Guiana, June 13, 1 ♀.

Catia vesuria (Plotz)

Fredericksted, St. Croix, Virgin Islands, March 25, 1 ♂, 1 ♀.
Male genitalia (Fig. 22).

Atrytone mella Godman

Ongelijk, Para River, Dutch Guiana, April 25, 1 ♂. Zanderij Island, Boven, Para River, Dutch Guiana, April 24, 1 ♀.

Atrytone barbara new species (Pl. I, Fig. 3, ♂, 13, ♀.)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14, 1♂, 1♀.

♂. Wings above brown, with orange yellow markings as follows; the lower part of the costa of the upper wings orange, lighter yellow subapical patch, and oblique band from beyond the cell to the inner margin about one fourth the width of the wing. The lower wing has a broad discal yellow orange patch, somewhat removed from the base and separated from the outer and inner margins by the brown basal color; the patches on both wings cut by brown on the veins. Fringes of upper wing brown, of lower wing brown above and at the anal angle and inner margin strongly orange yellow.

Wings below yellow, of a lighter tone than above. The upper wing with brown at the base extending in a ray below the cell, and with a brown line at the end of the cell. A brown patch at the inner angle, and the inner margin brown. Lower wing yellow, immaculate.

Body above with brown, orange, and greenish hairs, below lighter yellow. Head with orange collar and tufts; palpi orange yellow tipped with brown; antennae brown, ringed, the club reddish. Expanse 25 mm.

♀. The female is dark olive brown above, the orange markings of the male present on the upper wing very much reduced, on the lower wing the disc shows a patch of lighter scales and olive hairs only. The fringes on both wings lighter in contrast with the brown ground color of the wings light greenish yellow. The upper wings with the brown patches of the male more extended and in addition a brown line on the outer margin and the fringes cut with brown. The lower wings immaculate except for some darkening on the inner margin, a dark line on the outer margin and the fringes cut with brown. Expanse 29 mm. The male and female were caught by Dr. Forbes in copula.

Male genitalia (Fig. 23). Those of *barbara* differ from those of its two nearest allies, *mella* and *logan*, in the shape of the uncus, which in *barbara* ends in a shorter bifid projection not so hooked as in the other species, and the saccus is also longer. The aedoeagus ends in five strong points, and is without the hairy sponge like floating mass present in the other species.

This species is nearest to *Atrytone mella* Godman, from which it differs in that the brown markings of the male are more extended, the spot in the cell and below the cell in the male is more conspicuous, very dark brown, almost black. The female

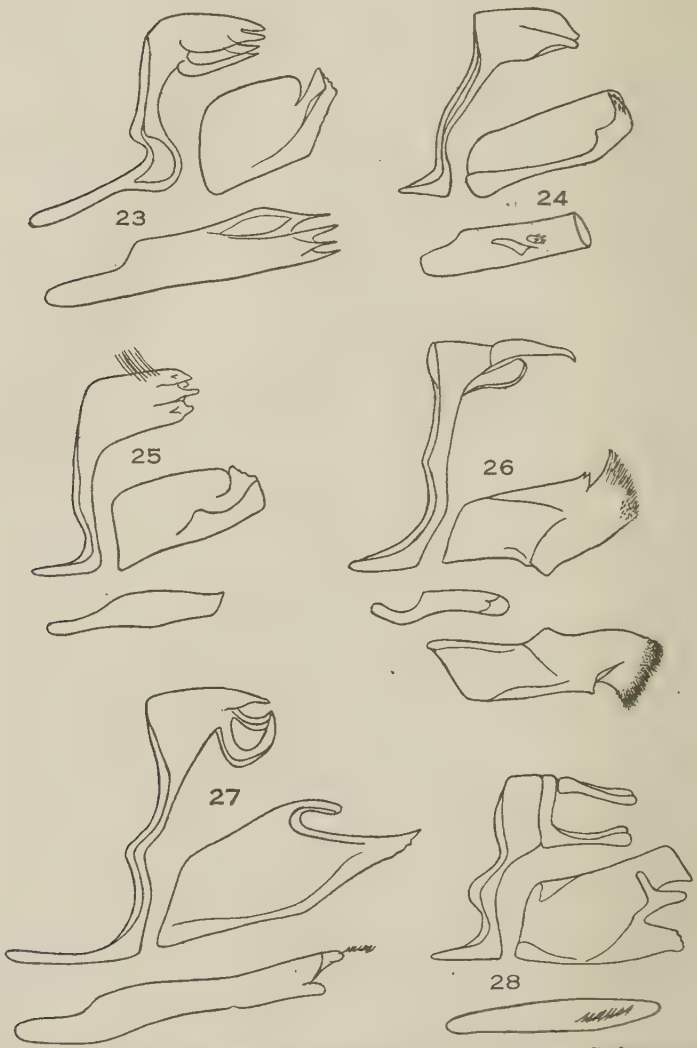


Fig. 23. *Atrytone barbara* new species. 24. *Prenes eugeon* Godman and Salvin. 25. *Cobalus virbius* Cramer. 26. *Phanes almoda* Hewitson. 27. *Phanes rezia* Plotz. 28. *Euroto saramacca* new species.

differs from *mella* in having the orange yellow markings of the upper wing very much more reduced and the lower wing with only a lighter discal patch.

Type.—♂, and allotype (♀). These are in the collection of the Academy of Natural Sciences of Philadelphia.

Atrytone vitellius (Fabricius)

Paramaribo, Dutch Guiana, April 9, 1♂.

Fredericksted, St. Croix, Virgin Islands, March 25, 1 small ♀.

Atrytone tristis Lindsey

Rockstone, Essequebo River, British Guiana, June 26, 1♂.

Lerodea eufala (Edwards)

Fredericksted, St. Croix, Virgin Islands, March 26, 1♂. Small and with spots faintly indicated.

Zariaspes mys (Hübner)

Moengo Boven, Cottica River, Dutch Guiana, May 12, 13, 2♂.

Padraona epictetus (Fabricius)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14–15, 5♂, 2♀. Moengo Boven, Cottica River, Dutch Guiana, May 12, 19, 3♂. Kwakoegron, Saramacca River, Dutch Guiana, June 8–13, 5♂.

Tumatumari, Potaro River, British Guiana, June 28, 2♂.

Port of Spain, Trinidad, July 10, 1♂.

Mackenzie, Demerara River, British Guiana, June 24, 1♂.

Prenes nyctelius (Latreille)

Moengo Boven, Cottica River, Dutch Guiana, May 24, 1♂.

According to Riley, who has examined the type, this name should replace *ares* Felder.

Prenes sylvicola (Herrich-Schaeffer) form **fusina** (Hewitson)

Paramaribo, Dutch Guiana, April 6, 1♂, 1♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 16, 1♂.

Fredericksted, St. Croix, Virgin Islands, March 27, 1♂.

Basseterre, St. Kitts, British West Indies, 1♂.

Point à Pitre, Guadeloupe, May 26, 1♂, 1♀.

Port of Spain, Trinidad, July 12, 1♂, 1♀.

Prenes vala (Mabille)

Kwakoegron, Saramacca River, Dutch Guiana, June 13, 1♀.

Prenes eugeon Godman and Salvin (Pl. I, Fig. 9, ♂.)

Grenada, British West Indies, July 13, 1♂.

A rather small specimen.

Male genitalia (Fig. 24). The uncus ends in a pair of smooth projections, close together, the scaphium (10th sternite) missing. The valve ends in an upturned sharp hook; the termination of the harpe is rounded. The short stout aedoeagus carries two thorns, one of them large and strong, the other with a number of toothed spines.

Vacerra bonfilius (Latreille) race **litana** (Hewitson)

Kwakoegron, Saramacca River, Dutch Guiana, June 10, 1♀.

Niconiades caeso (Mabille)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 13, 1♀.

Niconiades xanthaspes Hübner

Moengo Boven, Cottica River, Dutch Guiana, May 18, 1♂.

Cobalus cannae Herrich-Schaeffer

Georgetown, British Guiana, July 22, 1♂.

Port of Spain, Trinidad, July 12, 1♂.

These are both rather small specimens.

Cobalus virbius (Cramer)

Zanderij Island, Boven, Para District, Dutch Guiana, April 19, 1♂. Moengo Boven, Cottica River, Dutch Guiana, May 19, 1♂.

Male genitalia (Fig. 25). The uncus ends in three convoluted blunt projections. The valve terminates in two truncate projections, the lower one overlapping the upper one, both serrate outwardly, otherwise the valve is simple and smooth. The aedoeagus is quite simple.

Cobalus zeppa (Moschler)

Moengo Boven, Cottica River, Dutch Guiana, May 12, 1♀.

Cobalus percosius Godman

Tumatumari, Potaro River, British Guiana, June 25, 1♂.

Perimeles remus (Fabricius)

Kwakoegron, Saramacca River, Dutch Guiana, June 10–14, 2♂, 3♀.

Eutychide cingulicormis Herrich-Schaeffer

Zanderij Island, Boven, Para District, Dutch Guiana, April 20, 1♀.

This has two apical spots on the upper wing and lacks the spots on the lower wing above; below, the wing differs from the Godman and Salvin figure[4] in that the basal area is violet and not white. Original spelling *cingulicormis* not *cingulicornis* of the Biologia and Seitz.

Eutychide complana (Herrich-Schaeffer)

Kwakoegron, Saramacca River, Dutch Guiana, June 10, 1♂.

This is the same as *midea* Hewitson, the male genitalia of which are figured by Godman in the Biologia.

Phanes almoda (Hewitson)

Tumatumari, Potaro River, British Guiana, June 28, 1♂.

Male genitalia (Fig. 26). The uncus is long and slender with a single beak at the extremity, scaphium short, a simple fold. The valve end is truncate, provided externally with numerous short bristles. The aedoeagus is short and simple.

Phanes rezia (Plotz)

Mackenzie, Demerara River, British Guiana, June 22, 1♂.

Male genitalia (Fig. 27). The uncus ends in a single snout. Below this there are two arms meeting at their upturned points. These we believe to be part of the uncus and not the scaphium, which is missing. The saccus is rather long and slender. The valve ends in a long pointed projection toothed below at its terminus. The harpe ends in a finger like projection. The rather stout aedoeagus carries a series of short spines, shown externally in our figure.

[4] Biol. Cent.-Am., Pl. 99, Fig. 7.

Euroto compta (Butler)

Ongelijk, Para River, Dutch Guiana, May 2, 1♂. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 12–14, 2♂. Paramaribo, Dutch Guiana, April 9, 18, 2♀. Moengo Boven, Cottica River, Dutch Guiana, May 21, 1♂.

We have identified these as *compta*, with which they agree very well genitalically, and in that the hyaline spots on the superior wings are well shown. *Lyde* Godman may be the same species with the hyaline spots minute or absent. The differences in the Biologia figures of the genitalia may be due to natural variation.

Euroto micythus Godman

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 12, 2♂.

Port of Spain, Trinidad, July 12, 1♂.

Euroto saramacca new species (Pl. I, Fig. 8, ♂.)

Kwakoegron, Saramacca River, Dutch Guiana, June 7–15, 9♂, 5♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–16, 15♂, 5♀. Zanderij Island, Boven, Para District, Dutch Guiana, April 19, 1♂. Paramaribo, Dutch Guiana, April 4, 1♂; June 1, 1♂, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 14, 1♀.

Port of Spain, Trinidad, July 12, 1♀.

♂. Wings above dark brown, immaculate below, somewhat lighter only; fringes concolorous. The primaries have a brand, scarcely indicated, consisting of a spot or dash just below the cell, between it and the first radial vein, and another minute spot below it. Body, head and palpi dark brown above. Below, the abdomen lighter to ash brown, the palpi with some olivaceous hairs. Antennae two-thirds the length of the costa, brown, lighter under the club and below the club and apiculus. Expanse 25 to 28 mm.

♀. Similar to the male except that there are sometimes a few lighter marks beyond the disc of the secondaries below. Expanse 25 to 29 mm.

Male genitalia (Fig. 28). The uncus has four projections, two above, very wide apart, and two below, similar and of the same length; the tegmen narrow and square; the girdle and saccus slender. The valve ends in a truncate cuiller, at the interior base of which there is a style ending in two arms at right angles

to each other. The harpe ends in a rounded projection longer than the cuiller and turned and folded inwardly. The aedoeagus, rather stout for its length, tapers to a point externally and carries a series or tuft of short spines.

Type.—♂, from Kwakoegron, and allotype (♀) from Sint Barbara, also 12♂ and 6♀ paratypes, are in the collection of the Academy of Natural Sciences of Philadelphia; 13♂ and 6♀ paratypes are in the Bell Collection.

Euroto potaro new species (Pl. I, Fig. 10, ♂.)

Tumatumari, Potaro River, British Guiana, June 28, 2♂. Georgetown, British Guiana, June 22, 1♂. Mackenzie, Demerara River, British Guiana, June 22, 24, 2♂, 3♀.

♂. Wings above uniformly dark brown, upper wing with two minute whitish dots, one before the apex and another below, these dots sometimes obsolete; fringes somewhat lighter. Below, the upper wings are somewhat lighter on the costa and outer margin, a still lighter splash before the inner margin, the veins very lightly outlined by lighter scales. The two dots of the upper side repeated and a third one below, set inwardly.

The lower wing uniformly brown, the veins slightly outlined lighter and four very faint whitish dots in the submarginal interspaces, these dots or thin dashes sometimes obsolescent or obsolete. A thin darker line before the fringes, which are brownish gray. Body dark brown, lighter below; palpi with some orange hairs. Expanse 27 mm.

Male genitalia (Fig. 29). The uncus has four slender, rather widely separated projections, two above and two below; the saccus is long and slender. The valve ends in an upturned truncate cuiller rather serrated outwardly. The long slender aedoeagus is provided with two groups of closely set minute teeth, the inner one long and narrow, the outer one shorter.

Type.—♂, and allotype (♀) from Tumatumari, also two paratypes are in the collection of the Academy of Natural Sciences of Philadelphia; four paratypes are in the Bell Collection.

Phlebodes tiberius (Moschler)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14, 15, 2♂. Zanderij Island, Boven, Para District, Dutch Guiana, April 20, 2♀.

Phlebodes fartuga Schaus

Moengo Boven, Cottica River, Dutch Guiana, May 14, 19, 2♂.

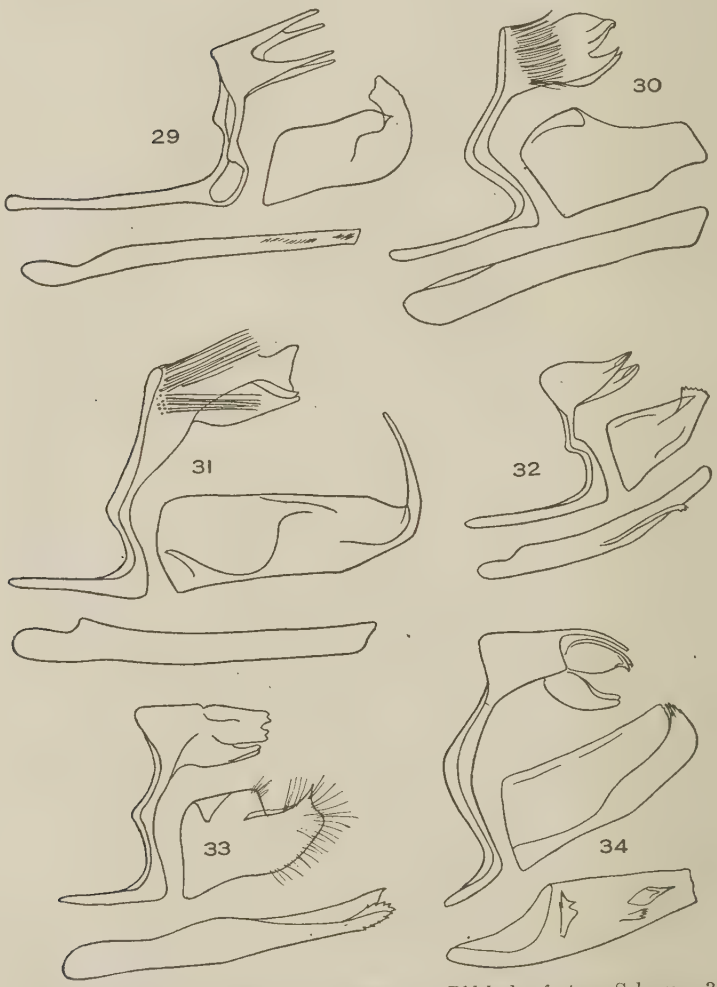


Fig. 29. *Enroto potaro* new species. 30. *Phlebodes fartuga* Schaus. 31. *Phlebodes reticulata* Plotz. 32. *Vehilius forbesi* new species. 33. *Vettius laurea* Hewitson. 34. *Thracides hermesia* Hewitson.

Male genitalia (Fig. 30). The very stout uncus ends in two sharp beaks, below which there are two pointed upturned processes; the base is densely haired. The saccus is long and slender. The valve is simple, ending in a smooth rectangular process. The aedoeagus is stout and simple.

Phlebodes reticulata (Plotz)

Moengo Boven, Cottica River, Dutch Guiana, May 16, 1♂.

Godman considers *meton* Mabille from Teffe and *suffenas* Mabille from Porto Cabello to be synonyms of *reticulata* Plotz from Laguayra, Chiriqui. The figures in the Seitz work are very crude ones but the Mabille description of *meton* seems to apply to our Surinam insect.

Male genitalia (Fig. 31). They differ from those of *tiberius*, to which it is closely allied, by the shape of the uncus, which in *reticulata* has a broad eared terminus with two upturned hooks below it. Also the base of the tegmen is provided with dense needle shaped stout hairs which project directly parallel with and over the uncus, reaching almost to the terminal, these not being present in *tiberius*.

The valve has the long slender upturned hook as in *tiberius*. The aedoeagus is rather long, cylindrical and simple.

Papias phaeomelas (Hübner)

Kwakoegron, Saramacca River, Dutch Guiana, June 8, 1♂.

Tumatumari, Potaro River, British Guiana, June 28–29, 2♂, 1♀.

According to Lindsey, *Papias microsema* Godman is the same as *phaeomelas*.

Mnaseas bicolor (Mabille)

Kwakoegron, Saramacca River, Dutch Guiana, June 14, 2♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–14, 7♂, 1♀. Zanderij Island, Boven, Para District, Dutch Guiana, April 20, 1♂. Ongelijk, Para River, Dutch Guiana, May 2, 1♀.

Thargella fuliginosa Godman

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–15, 2♂, 2♀. Kwakoegron, Saramacca River, Dutch Guiana, 2♀. Paramaribo, Dutch Guiana, May 30, 1♀.

Mnasitheus simplicissima (Herrich-Schaeffer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–12, 2♂. Kwakoegron, Saramacca River, Dutch Guiana, June 8–13, 1♂, 2♀.

Tumatumari, Potaro River, British Guiana, June 28–29, 2♂, 2♀. Rockstone, British Guiana, June 26, 1♂.

Port of Spain, Trinidad, July 12, 1♂.

Mnasilus penicillatus Godman

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 14–16, 2♂. Ongelijk, Para River, Dutch Guiana, May 2, 1♂.

Georgetown, British Guiana, June 24, 1♂.

The specimens are very dark, the fulvous discal and subapical spots of the primaries greatly reduced from those shown in the Biologia (Pl. 100, Fig. 39).

Vehilius celeus (Mabille)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–16, 4♂, 4♀. Canal from River Para to River Surinam, on boat April 8, 1♂. Paramaribo, Dutch Guiana, April 4–28, 8♂, 3♀.

Vehilius scheria (Plotz)

Tumatumari, British Guiana, June 28, 1♀.

Vehilius venosus (Plotz)

Paramaribo, Dutch Guiana, April 4–7, 4♂, 2♀; May 4, 1♂; June 1, 2♂. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–15, 4♂, 4♀. Moengo Boven, Cottica River, Dutch Guiana, May 12–26, 18♂, 9♀ (one taken at light). Kwakoegron, Saramacca River, Dutch Guiana, June 10–15, 5♂. Ongelijk, Para River, Dutch Guiana, April 30–May 2, 6♂.

Mackenzie, Demerara River, British Guiana, June 24, 2♂, 2♀. Rockstone, Essequebo River, British Guiana, June 26, 4♂. Tumatumari, Potaro River, British Guiana, June 28, 1♂, 1♀. Georgetown, British Guiana, June 24, 1♂.

Port of Spain, Trinidad, July 12, 1♂.

Vehilius forbesi new species (Pl. I, Fig. 7, ♂.)

Georgetown, British Guiana, June 22, 1♂. Mackenzie, Demerara River, British Guiana, June 22, 1♀.

♂. Wings above uniformly dark brown, almost black above. The upper wings with three hardly perceptible lighter dots, two apical and one removed, below. Fringes concolorous. Below, of the same color with a slightly chestnut tinge, the forewings with a slightly lighter patch at the interior portion of the inner border. At the apical portion of the wing the veins are outlined with lighter yellowish scales and there are dashes of this color more faintly outlined between them. The lower wings below have all the veins so outlined and there is a row of dots as well in the interspaces before the outer margin. Body dark brown. Palpi brown above, mottled olive gray below. Expanse 20 mm.

♀. The female is of the same color and with the same markings as the male; the apex of the primaries less pointed and anal angle of the secondaries more rounded. Expanse 21 mm.

Male genitalia (Fig. 32). The uncus has two parts ending in bifid slender beaks, the points turned towards each other. There is a quantity of hair on the internal portion above. The tegmen is short, the saccus long and slender. The valve is simple, wide at the base and tapering to the extremity, which ends in a cuiller, rounded outwardly, and coming to a point dorsally, the outer portion with fine teeth. The long and slender aedoeagus carries a floating arm about one-third its length, the external end is rounded and provided with fine teeth.

Type.—♂, and allotype (♀) are in the collection of the Academy of Natural Sciences of Philadelphia.

In addition to the pair from the Forbes catch, we have nine other males and one female which we make paratypes, one male from Warani, three males and one female from Bartica, and one male from the Potaro River, British Guiana, and one male from Muzo and three males from Eastern Colombia.

Megistias tripunctata (Latrielle)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–12, 3♂, 2♀. Moengo Boven, Cottica River, Dutch Guiana, May 12–24, 2♂, 3♀. Ongelijk, Para River, Dutch Guiana, May 1, 1♀. Paramaribo, Dutch Guiana, April 5, 1♂, 1♀; May 4, 1♀; June 1, 1♀. Zanderij Island, Boven, Para District, Dutch Guiana, May 1, 1♂. Kwakoegron, Saramacca River, Dutch Guiana, June 7–13, 3♂, 5♀.

Georgetown, British Guiana, June 24, 1♂, 2♀. Mackenzie, Demerara River, British Guiana, June 24, 1♂.

Megistias tripunctus (Herrich-Schaeffer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–14, 1♂, 2♀. Moengo Boven, Cottica River, Dutch Guiana, May 2, 1♂; May 12–25, 7♂ (some at light). Paramaribo, Dutch Guiana, April 6, 1♂; April 18, 1♂; May 4, 1♀. Kwakoegron, Saramacca River, Dutch Guiana, June 10, 1♀.

Port of Spain, Trinidad, July 10, 1♂.

Megistias huascari Lindsey

Zanderij Island, Boven, Para District, Dutch Guiana, April 20–27, 2♂. Kwakoegron, Saramacca River, Dutch Guiana, June 7–13, 1♂, 3♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 15, 1♂.

Megistias catocala (Herrich-Schaeffer)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11–16, 4♀.

Megistias labdacus Godman

Paramaribo, Dutch Guiana, April 4–28, 8♂, 3♀.

Port of Spain, Trinidad, July 12, 2♂, 1♀. St. Augustine to Carom River, Trinidad, July 11, 1♂.

There is a certain amount of variability among individuals of this species in the distinctness of the discal spots of the primaries and in the maculation of the underside of the secondaries, where there may be a curved band of discal spots or none, and the veins may, or may not be noticeably paler.

Megistias noctis (Plotz)

Kwakoegron, Saramacca River, Dutch Guiana, June 8–15, 5♂, 4♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11, 3♂, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 12–16, 2♂, 1♀.

Two of these are very much larger than the others.

Noctis has page priority over *corticea* Plotz, and *epiberus* Mabille is, according to Godman and Salvin, a synonym of *corticea.*

We can get very little from the text of the original descriptions of *noctis, corticea* and *lysias* Plotz, but our understanding of these names from what Draudt has written in Seitz, is that *noctis* represents a dark insect, that is, with reduced bands, *corticea* one

with a prominent band and *lysias* between these two; in which case *lysias* has no standing and becomes a synonym of *corticea*. We do not believe that the insects can be separated on size, but rather on whether the specimen has a well marked band or has the band much reduced or absent. Godman notes the variability of the species (*epiberus*); we have a long series of them from the Canal Zone to Paraguay and Brazil, and they vary in size in any locality, though the largest of any we have are the Forbes specimens, and also as to maculation, we can get any intergrade from plainly banded specimens to immaculate ones or nearly so; none of our specimens are quite so extensively banded as that figured in the Biologia. We think, no matter which character is used, size or the prominence of the band, it will be difficult to determine where one form ends and the other begins.

We here separate our Forbes specimens as to size and bands:

Larger size

- Very dark
  - Moengo, May 12, 1♂.
  - Kwakoegron, June 13–15, 1♂, 1♀.
- Well marked
  - Sint Barbara, April 11, 1♂.

Smaller size

- Very dark (none in Forbes material but we have them from the Canal Zone).
- Intermediate
  - Sint Barbara, April 11, 2♂, 1♀.
  - Moengo, May 16, 1♀.
- Well marked
  - Kwakoegron, June 8, 13, 15, 4♂, 3♀.
  - Moengo, May 16, 1♂.

Megistias telata (Herrich-Schaeffer)

Port of Spain, Trinidad, July 10, 2♂.

Megistias theogenis (Capronier)

Paramaribo, Dutch Guiana, April 5, ♀. Sint Barbara Plantation, Surinam River, Dutch Guiana, April 11th, 1♀.

Parphorus storax (Mabille)

Zanderij Island, Boven, Para District, Dutch Guiana, April 24, 1♂. Moengo Boven, Cottica River, Dutch Guiana, May 24, 1♂.

Carystus artona (Hewitson)

Moengo Boven, Cottica River, Dutch Guiana, May 24, 1♀.
Port of Spain, Trinidad, July 12, 1♂.

Carystus fantasos (Cramer)

Kwakoegron, Saramacca River, Dutch Guiana, June 10, 1♀.

Carystus marcus (Fabricius)

Port of Spain, Trinidad, July 12, 2♂, 2♀.

Carystus subrufescens Schaus

Makenzie, Demerera River, British Guiana, June 22, 1♀.

Vettius laurea (Hewitson)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 1♀.

Male genitalia (Fig. 33). The uncas ends in a bilobed snout below which there are two pointed rather triangular processes. The valve ends in a cuiller shaped like a bird's head, the beak turned up; the harpe is short and rounded as it meets the cuiller. The long aedoeagus ends in two projections serrated at their termination.

Vettius triangularis (Hübner)

Kwakoegron, Saramacca River, Dutch Guiana, June 12, 1♀.

Coeliades fiscella (Hewitson)

Moengo Boven, Cottica River, Dutch Guiana, May 21, 1♂.

Flacilla aecas (Cramer)

Mackenzie, Demerara River, British Guiana, June 22, 1♂. Ongelijk, Para River, Dutch Guiana, April 8, 1♂.

Godmania silius (Latrielle)

Port of Spain, Trinidad, July 12, 1♀.

Callimormus corades (Felder)

Paramaribo, Dutch Guiana, April 3–15, 1♂, 2♀; May 4, 1♀; June 1, 1♀. Ongelijk, Para River, Dutch Guiana, May 1, 1♂. Kwakoegron, Saramacca River, Dutch Guiana, June 14, 1♂. Moengo Boven, Cottica River, Dutch Guiana, May 13, 1♂.

Port of Spain, Trinidad, July 10, 1♂.

Callimormus radiola (Mabille)

Georgetown, British Guiana, June 22, 2♀. Mackenzie, Demerara River, British Guiana, June 22–24, 2♀.

Moengo Boven, Cottica River, Dutch Guiana, April 14, 1♀.

Port of Spain, Trinidad, July 12, 1♂.

We believe this is *radiola* Mabille, and that *fabulinus* Plotz is the ♀ of *radiola*, and that *filata* Plotz is a synonym.

Callimormus gracilis (Felder)

Kwakoegron, Saramacca River, Dutch Guiana, June 15, 1♂.

Artines atizies Godman

Moengo Boven, Cottica River, Dutch Guiana, May 21, 1♀.

Port of Spain, Trinidad, July 12, 2♂.

Carystoides basoches (Latreille) form **replana** (Plotz)

Zanderij Island, Boven, Para District, Dutch Guiana, April 21, 1♂, 1♀. Moengo Boven, Cottica River, Dutch Guiana, May 12, 1♂.

Thracides chiomara (Hewitson)

Port of Spain, Trinidad, July 12, 1♂.

Thracides salius (Cramer)

3 Friends Mine, Demerara River, British Guiana, June 23, 1♀.

Thracides hermesia (Hewitson)

Port of Spain, Trinidad, July 12, 2♂.

Male genitalia (Fig. 34). The uncus consists of a pair of ovate projections with beaks at the ends. The tegmen is extended above into a long finger, almost reaching the end of the uncus. The scaphium consists of a pair of lobes reaching to about the end of the uncus. The girdle is slender, the saccus short. The valvae are rather simple, with a rounded cuiller with

an upturned, toothed beak. The aedoeagus is short and stout carrying three floating processes, two with toothed projections and one with a single stout tooth.

Thracides telegonus (Esper)

Moengo Boven, Cottica River, Dutch Guiana, May 23, 1♂. Zanderij Island, Boven, Para District, Dutch Guiana, April 26, 1♀.

The male is a form dark below, the female might be referred to the form *longirostris* Sepp.

Port of Spain, Trinidad, July 10, 1♂.

Perihares coridon (Fabricius)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 15, 1♀.

Perichares lotus (Butler)

Sint Barbara Plantation, Surinam River, Dutch Guiana, April 15, 1♂.

Talides sergestus (Cramer)

Zanderij Island, Boven, Para District, Dutch Guiana, April 19–22, 2♂.

In addition to the species listed above, we have twelve insects, nine females, which we are not able to associate with any of the males taken, or species with which we are familiar, and three males, which we do not feel warranted in describing as new on account of their poor condition.

Phanus godmani new species (Pl. I, Fig. 2, ♂.)

♂. Wings above brown, some lighter hairs and scales at the base of the primaries and costa of the secondaries. With many hyaline marks, transparent and with a decidedly bluish tinge in some lights. Before the apex three rectangular spots followed by two smaller ones; a long bifid ray four mm. from the base, the lower arm in and ending in the cell and the upper one in the interspace above and extending beyond the lower arm to within six mm. of the apex. Beyond the lower arm is a dash parallel to, and ending with the upper arm. Below these in the fourth interspace and triangularly outlined by the veins is another heavy spot, also bifid; the upper arm ending in a point, the lower

one a finger reaching to within 2 mm. of the outer margin. Beyond this in the interspace above is a large rhomboid spot excavated outwardly. In the third interspace is another spot just below the finger of the discal ray, triangular, pointed within and excavated outwardly. Below in the second interspace a rectangular spot set within the spot above. The lower wing has a broad ray occupying the entire cell and extending beyond it in a rectangle, lightly cut by the cell vein terminal. An outer band of rather rectangular spots, the upper more triangular, just above the end of the costal ray, the next midway between the ray and the margin, two similar below this and parallel with the margin. In the next interspace a mere dot, and in the next, the third interspace, another rectangle set somewhat more inwardly. There is a discal row of three triangular spots parallel from the end of the discal ray inwardly towards the inner margin. Inside of these is a ray or line parallel with and just below the cell. Fringes slightly lighter than the ground color, on the inferior wing white just before and at the anal angle. The male has a costal fold 9 mm. long. Wings below similar, somewhat lighter the spots repeated appearing more bluish. Body brown above, gray below, palpi mixed black and gray, two white fine hair tufts on each side of the head above next to the eyes. Antennae dark brown, the strong hook sickle shaped. The male genitalia is figured (Fig. 8). Expanse 37 mm.

♀. The female is the same as the male in color and markings.

Type.—♂; Cartago, Costa Rica, (Ethel Gillott). *Allotype,* ♀; same data. Both in the Academy of Natural Sciences of Philadelphia.

TWO NEW HESPERIDS FROM ECUADOR

BY ROSWELL C. WILLIAMS, JR.

Yanguna blossomiae new species. (Pl. XXV, fig. 4.)

Wings above brilliant metallic dark blue, changing to blue green in certain lights. The primaries have three subapical hyaline dots in a curved line, and three large discal spots in a band, the upper one a rhomboid, the second more rectangular and the third and lower a triangle. These are well separated by the veins. The base of both primary and secondary wings with hairs of a deep orange color on the primaries covering about one sixth of the surface and on the secondaries in a patch or double splash from the base half way across the wing and occupying the cell and space above and below it and a space between the cell and inner margin. Fringes of the primaries black, of the secondaries black with a deep reddish tinge.

Below the wings of the same color, but with a more decidedly greenish reflection, especially on the secondaries. On the primaries the three subapical spots are repeated. The three central spots are repeated, but slightly larger or less separated by the veins, and there is an additional blue white stripe between the upper spot and the costal margin. At the base of the wings there are a few small spots of orange. The thorax is all orange above, the head black with a white line externally and two blue white round spots before the antennae, two white short stripes between them, two more behind the antennae and a whitish gray line behind the head. Below, the white surrounds the eyes, the palpi are brilliant white externally, black within, and the pecti are white. There are some orange markings on the sides of the thorax. The legs are black with blue white lines on the first joints. The abdomen is velvety black, ringed with blue white, more distinctly white below. Anal fringe black, a white line as it joins the abdomen. The antennae and club black. Expanse 58 mm.; from thorax to apex of primary, 33 mm.

Described from one male caught by Mr. W. Judson Coxey in May 1930, at Huigra, Ecuador. Named for Mr. Coxey's charming daughter. The type is deposited in the Academy of Natural Sciences of Philadelphia.

Endamus coxeyi new species. (Pl. XXV, fig. 12.)

♂. Wings above deep brown, the base of the primaries and the base and a large portion of the disc of the secondaries shot with deep blue hairs, in some lights changing to green. The

primaries have three apical dots, two in line and a third removed outwardly; beyond and below these a line, and a fifth, a triangle, below and within, in the next interspace. These last two apical spots are obsolescent; in seven specimens the fourth spot is missing and the fifth only indicated by a dot, and in one the fourth and fifth are absent altogether. There is a discal band of five hyaline spots, four in a line and one removed outwardly: the first at the costal margin is in the form of two white lines sometimes united; the second is rectangular with a spur from the costal corner pointed towards the apex; the third is rectangular, the inner corner just touching the outer corner of the one above; the fourth is also rectangular and removed from the third, towards the outer margin of the wing. There is a fifth spot, rectangular and smaller, just beyond and above the third spot mentioned above.

The costal fold is present in the male, but rather short and small compared with allied species.

Wings below brown, much lighter at the costal and inner margins of the primaries and the whole of the disc of the secondaries. The secondaries have two brown spots towards the costal margin and two situated in a line between the location of the costal spots, one in the cell and one below, connected. There is a brown extradiscal band, almost parallel with the outer margin from the second interspace to the anal interspace. The tail is dark brown, shading in the anal portion of the wing into the light ground color. The fringes are gray. The inferior wings are elongated and have a short tail.

The body above is covered with deep blue green hairs extending well towards the end of the abdomen which is dark brown with the segments slightly ringed with blue; head green.

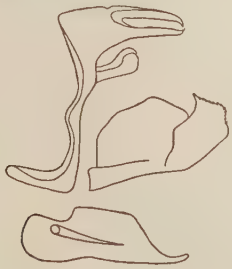


Fig. 35. *Eudamus coxeyi*, ♂ genitalia.

Below the body is light brown, with green hairing on the sides; palpi gray-brown. Antennae black, lighter below and below the

club, the apiculus of which is strongly hooked and turned back. Expanse 41 mm. From thorax to tip of primary 24 mm.; to tip of tail 23 mm

♀. The female is like the male.

The male genitalia (Fig. 35).

Type.—♂ and 3 paratypes (♂) from Naranjapata, Ecuador, elevation 1850 feet, November, 1926. *Allotype.*—♀ and 5 paratypes (♂) from Dos Puentes, Ecuador, elevation 1700 feet, January, 1929. One paratype ♀ from Huigra, Ecuador, elevation 4000 feet, January, 1929. These were all collected by Mr. William Judson Coxey, who was in Ecuador in 1926, 1929 and 1930, where he gathered a large collection of butterflies which are deposited in the Academy of Natural Sciences of Philadelphia

This species is close to *Yanguna staudingeri* Plotz, from which it differs in that there is more orange red on the wings, and it is easily separated by the fringes of the inferior wings, which in *staudingeri* are broadly brilliant white.

Explanation of Plate XXV

Fig. 1. *Polites dictynna* Godman and Salvin. ♂.
Fig. 2. *Phanus godmani* new species. ♂.
Fig. 3. *Atrytone barbara* new species. ♂.
Fig. 4. *Yanguna blossomiae* new species. ♂.
Fig. 5. *Entheus mina* new species. ♂.
Fig. 6. *Entheus mina* new species. ♀.
Fig. 7. *Vehilius forbesi* new species. ♂.
Fig. 8. *Euroto saramacca* new species. ♂.
Fig. 9. *Prenes eugeon* Godman and Salvin. ♂.
Fig. 10. *Euroto potaro* new species. ♂.
Fig. 11. *Cogia freudiae* new species. ♂.
Fig. 12. *Eudamus coxeyi* new species. ♂.
Fig. 13. *Atrytone barbara* new species. ♀.

WILLIAMS AND BELL—AMERICAN HESPERIIDAE

NOTES ON GRYLLOBLATTA CAMPODEIFORMIS AND A DESCRIPTION OF A NEW VARIETY

(GRYLLOBLATTIDAE)

BY F. SILVESTRI
Portici, Italy

(Plate XXVI and text-figure)

During the summer of 1930 I paid a short visit to the type locality of *Grylloblatta campodeiformis* Walker at Banff, Alberta, Canada, and collected some specimens of this species on Mount Sulphur at an altitude of between six and seven thousand feet. I collected there July 11th and found specimens among the small stones and vegetable debris on the sloping banks of a creek and many more among the stones and soil in the bank on the upper side of a nearby path. No snow was present at either place, at the time of my visit, being limited to small patches at higher elevations. I would say that the habitat of this species, on Mount Sulphur, is limited to the small pockets between the stones and soil at a depth of a few inches to one or more feet, provided there is sufficient moisture. Young larvae of different stages from the first on, and a newly moulted female, were collected.

On the afternoon of July 12th I visited the base of Mount Fairview along Lake Louise, Alberta, Canada, and there collected two specimens of this species among the stones on a steep slope which were, in part, covered by moss. No snow was present here. Next morning, I walked along a path skirting the lake (Pl. XXVI, fig. 1), a few inches above the water on the left and a more or less high bank cut into the base of the mountain on the right. There I found some specimens including a few adults in the small pockets among the stones, soil and roots in the bank. Here, snow was absent at this time, but was present quite a distance up on the mountain. In this habitat I also collected a few specimens of *Haplocampa:* Campodeidae, a larva of a Curculionid and one of an Elaterid.

I was very much pleased to observe *Grylloblata campodeiformis* in its natural habitat, and regretted that my complete plans for travelling through Western Canada and the United States prevented me from remaining longer in Alberta in order to secure more specimens and make additional observations on the biology of that species. As it was my good fortune to observe *Grylloblatta* (*Galloisiana*) *nipponensis* Caudell and King, August 1925, in its type locality at Chuzenji, near Nikko, Japan, and *Grylloblatta* (*Ishiana*) *notabilis* Silvestri, June 1925, on a mountain near Michino-o, Nagasaki, Japan, I am able to state that the movements of *campodeiformis* are somewhat slower than those of the Japanese species.

After Alberta and British Columbia, Mt. Baker, Washington was visited, where on July 21 and 22, I investigated a slope of a hill on the east side of the mountain at about 5000 feet (Pl. XXVI, fig. 2), where many stones of various sizes had accumulated for a depth varying from one to two feet. There, taking out little by little the stones and soil, making a sort of a trench, specimens of *Grylloblatta* were found at about one to one and one-half inches below the surface. Snow was present at the lower edge of this slope. Two specimens were also found among the stones in the bank of a road about four hundred meters down from the Lodge Hotel, which latter is located at an elevation of 4200 feet.

On Mt. Baker twenty-two specimens of *Grylloblatta* were collected: one male in the last larval stage, ten males at the penultimate stage, six females at the penultimate larval stage and six small larvae, but no adults. I have carefully compared the specimens from Mt. Baker with those of the same stages from Banff and Lake Louise, and found but little difference except in the number of antennal joints. These comparisons are shown in the following table.

Banff and Lake Louise specimens.

Adult females: antennal joints, 28 (exceptional, 29).

Adult males: antennal joints, 28 (exceptional, 27).

Female larva: length of body, 13 mm.; antennal joints, 26; first tarsal article of third pair of legs, equalling in length the second and third taken together.

Mt. Baker specimens.

Adult females unknown (antennae very probably with 30–32 joints, judging from those of the larva).

Larval male at last stage: length of body, 15 mm.; antennal joints, 29–30; first tarsal article of third pair of legs very little longer than the second and third articles taken together.

Female larva: length of body, 13 mm.; antennal joints, 28.

As there is a small constant difference noticeable in the number of joints of the antennae in the immature stages of the Mt. Baker specimens I think that it represents a distinct variety of *campodeiformis* which I here describe.

Grylloblatta campodeiformis var. **occidentalis** var. nov.

Varietas haec a forma typica statura parum majore, antennis, cercis pedibusque pallum longioribus, antennis in ultimis (vel penultimis) larvis 28–30 articulatis.

Type.—Male in last larval stage; Mt. Baker, Washington, (F. Silvestri; July 21–22, 1930), [Coll. of Author]. Paratypes, 10 ♂, penultimate stage larvae; 6 ♀, penultimate stage larvae.

The actual known distribution of *Grylloblatta* in North America is as follows:

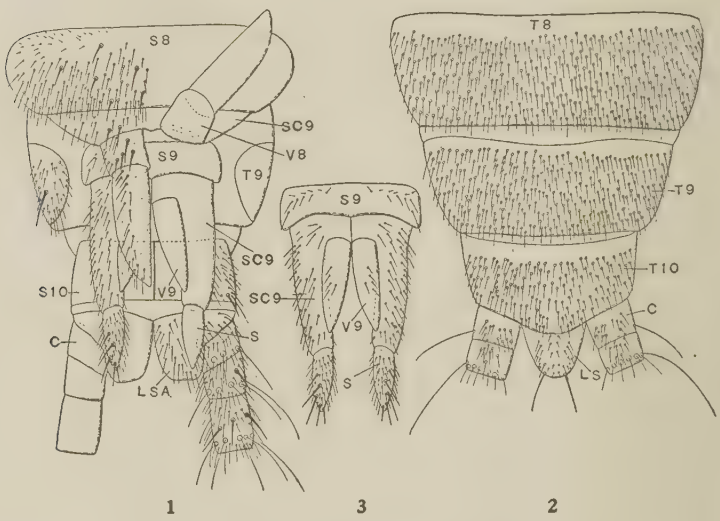
G. campodeiformis (typica), Alberta and East British Columbia, Canada.
G. campodeiformis var. *occidentalis*, Mt. Baker, Washington.
G. barberi Caudell, Plumas County, California.

I also visited Mt. Rainier, Washington; Mt. Hood, Oregon; Mt. Shasta, California, but did not find any specimens of this genus.

The most striking features in the external anatomy of this genus are found in the 5-jointed tarsi and in the presence of styli on the ninth segment of the abdomen. The forms of these styli in the male remain the same from the larva to the adult; but in

the female they transform into the external superior valvae of the ovipositor. In the inferior valvae, as well as in the internal superior valvae, of the ovipositor, we have homologies to the reversible vesicles of Tyhsanura.

It will surely be very interesting to have a complete embryological and morphological study of this genus as promised by Walker, but even now we know enough of its morphology to maintain *Grylloblatta* as a representative of a distinct family, Grylloblattidae, which must be placed in a group between Blattoidea and Isoptera, and with the same ordinal or subordinal rank.



Grylloblatta campodeiformis Walker

Fig. 1. Ventral aspect of apical segments of abdomen of female. C, proximal part of cerci; LSA, subanal laminae; S, styli of ninth segment; S8, S9, S10, eighth, ninth and tenth sternites; SC9, subcoxae of eighth and ninth sternites; V8, inferior valvae of ovipositor; V9, internal branch of the superior valvae of ovipositor.

Fig. 2. Dorsal aspect of apical segments of abdomen of female. LS, superior lamina analis.

Fig. 3. Ventral aspect of ninth sternite and its appendages.

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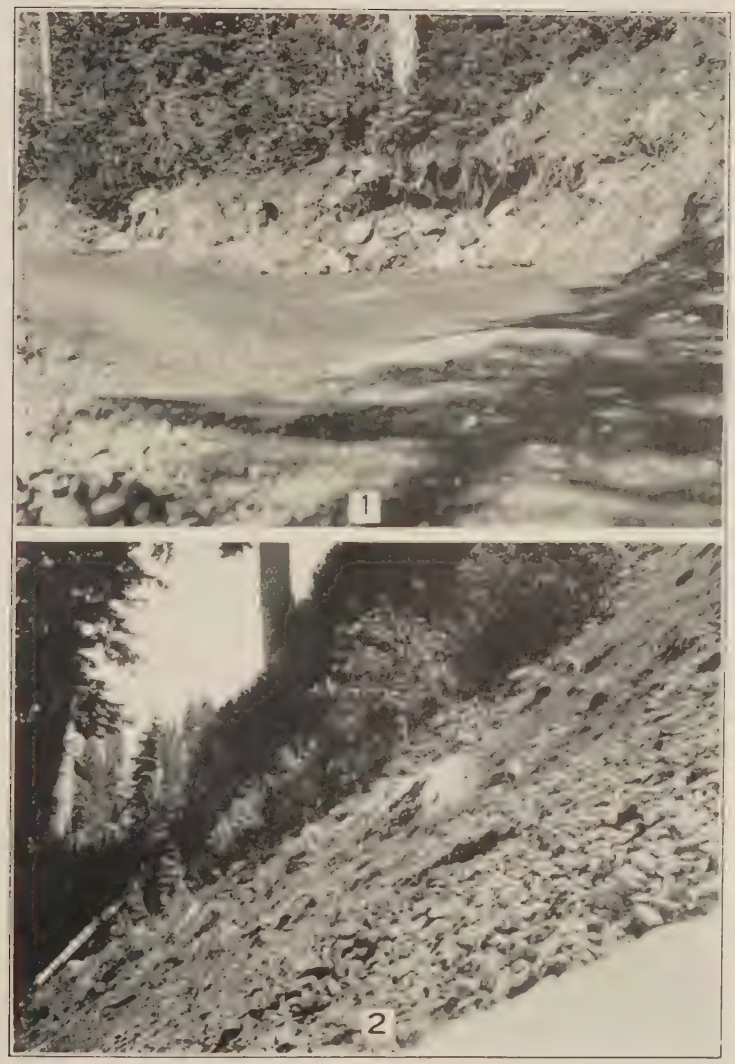
Explanation of Plate XXVI

Fig. 1. View of the path along the shore of Lake Louise, showing the sloping condition on the right side.

Fig. 2. View of the condition on Mt. Baker, Washington, where collections were made.



SILVESTRI—GRYLLOBLATTA

ON THE BLATTID GENERA ABRODIAETA BRUNNER (= ALLACTA SAUSSURE AND ZEHNTNER) AND MARGATTEA SHELFORD

(ORTHOPTERA)

BY JAMES A. G. REHN

(One text-figure)

In common with the condition found in other groups of insects, where cohesive and constructive revisionary work has not been attempted in the last few decades, efforts to secure a logical understanding of the genera of certain assemblages of the Blattidae have brought to light numerous cases of incorrect interpretation, or woeful distortion, of the generic conceptions of earlier, or sometimes unfortunately contemporary authors. Recent investigations have shed new light on many of these cases involving New World genera, and thus enabled us to form a truer idea of certain generic assemblages and their relationship, and to associate properly a large proportion of the generic names which have been proposed for them.

With the Old World genera the situation now requires some of what might be called the elementary corrective taxonomic work which already has been done for a large section of the American Blattidae. In the ectoboid-pseudomopoid section of the family we have in the Old World a large number of endemic genera, of but poorly understood relationship, and at the same time we have an extensive literature and numerous generic names. Unfortunately many of the latter have been used loosely by subsequent authors, which is hardly surprising in view of the often superficial or unstable features on which the genera were originally erected. In the majority of cases these genera are perfectly valid, but their redefinition in modern fashion is vitally essential, and here one is confronted by the inescapable necessity of examining the type species. As sometimes this species is authentically known only from the original material, the process requires

much time and the cordial and critical cooperation of colleagues in whose custody reposes the historic material.

Two generic entities of uncertain application which confronted me at various angles of studies on which I have been engaged, and thus required definite disposition once and for all, were *Abrodiaeta* Brunner and *Margattea* Shelford. Fortunately, with the cooperation which has been most willingly given by colleagues mentioned below, it has been possible to correct certain existing misconceptions regarding these names, and to redefine the entities to which they were applied.

Although the two names are now known to be rather intimately related, I shall discuss them separately and summarize my information and any warranted conclusions on a following page.

ABRODIAETA Brunner[1]

The original description of the genus and type species is as follows:

Genus vicinum generi Phyllodromiae, differt ab eo alis valde obtusis, vena radiali (scapulari) venulas complures irregulares et furcatas in marginem emittente, vena spuria nulla.

Caput magnum. Pronotum antice et postice truncatum. Elytra subcornea, venis parum expressis. Alae obtusae, vena radiali venulas valde obliquas et furcatas in marginem anticum emittente, vena spuria nulla, vena ulnari furcata. Femora parum spinosa, antica margine inferiore antico in parte basali minutissime spinuloso. Lamina supraanalis ♂ angusta, transversa. Lamina subgenitalis ♂ unistylata.

Ce genre est caractérisé par les elytres de texture cornée et la nervation des ailes. Il est voisin des genres *Ceratinoptera* et *Temnopteryx*, qui tous les deux ne sont pas suffisamment caractérisés. Je présume que le genre *Temnopteryx* sera dans la suite confondu avec le genre *Abrodiaeta*.

La *Phyllodromia latipennis*, Br. (N. Syst. des Blatt. p. 109) y rentre et je possède en outre plusieurs espèces de Madagascar, qui en font partie.

1. **A. modesta,** sp. n. (Tab. I, fig. 5).—Colore fusco ferrugineo. Frons lata, fascia fusca inter oculos signata. Antennae fuscae. Pronotum caput sat liberans, lateribus deflexis, postice truncatum, disco fusco-marmoratum. Elytra acuminata. Alae infumatae, venis fuscis; vena ulnari uniramosa (?). ♂.

long. corporis	♂	11	mm.
" pronoti	"	3,8	
lat. pronoti	"	5	
long. elytrorum	"	11	

Patria: Carin Ghecù (1300–1400 m.).

[1] Ann. Mus. Civ. Stor. Nat. Genova, XXXIII, p. 20, (1893).

The single original illustration of the type species[2] is small and little assistance can be secured for it, while it is equally true that few of the characters now considered generic criteria are mentioned in the description. In fact a portion of the latter is actually misleading,[3] and caused Hebard[4] to form an incorrect conception of the group relationship of the genus.

The first authors subsequent to Brunner discussing *Abrodiaeta* were Saussure and Zehntner,[5] who, finding Brunner's blattid generic name preoccupied by *Abrodiaeta* of the same author used in 1891 for a phaneropterid genus, specifically replaced it by the new name *Allacta*, and it is under the latter term that the generic concept has been referred to, incorrectly however, by subsequent authors. As *Allacta* is a substitute name, its type is that of *Abrodiaeta*, and this must be selected from the species originally included in *Abrodiaeta* by Brunner. Kirby's 1904 selection[6] of *lobata* Saussure, from the more numerous species included under *Allacta* by Saussure and Zehntner, is invalid, as stated by Hebard, whose 1922 fixation of *modesta* Brunner as the genotype is logical and final.[7]

In 1929 Hebard,[8] having been misled by Brunner's carelessly drawn diagnosis of the femoral spination of *Abrodiaeta*, considered *Allacta* inseparable from the genus *Mareta* and, on account of the apparent priority of the latter name, the former was placed by him as a synonym of *Mareta*.

Studies in which I am engaged on the African and Indian members of the genera centering about *Mareta* made it necessary to check anew the conclusions which had been reached, and a constantly recurring element of doubt as to exactly what *Abrodiaeta modesta* Brunner might be, caused me to make a fruitless search in available but unstudied Indian and Burmese collections for its counterpart. However, a number of species were found which would agree with the unsatisfactory original

[2] *A. modesta* Brunner, as properly selected by Hebard (Occ. Pap. Bern. Pauahi Bishop Mus., VII, p. 326, (1922)).

[3] "Femora . . . antica margine inferiore antico in parte basali minutissime spinuloso." The type specimen shows this is a most careless and superficial statement of the armament of the margin in question.

[4] Occ. Pap. Bern. Pauahi Bishop Mus., VII, p. 326, (1922); Proc. Acad. Nat. Sci. Phila., LXXXI, p. 18, (1929).

[5] In Grandidier, Hist. Phys. Nat. et Polit. Madagascar, XXIII, p. 45, (1895).

[6] Syn. Catal. Orth., I, p. 99.

[7] Vide supra.

[8] Proc. Acad. Nat. Sci. Phila., LXXXI, p. 18, (1929).

description, and they by modern standards would represent two or more genera. The sole remaining key to the problem then was to determine what light the type of *modesta* in the Genoa Museum would shed upon the situation.

With this in view I approached Dr. R. Gestro, Director of the Museo Civico di Storia Naturale, of Genoa, where the types of Brunner's species of the Fea collections are deposited. Definite information from the type of *Abrodiaeta modesta* was requested on numerous characters which are utilized today as blattid generic criteria. Dr. Gestro very kindly referred my request to Dr. Felice Capra, Conservator of the entomological collections at Genoa, and in a short time I received from Dr. Capra a most cordial reply to my request, conveying not only information upon the specific features requested, but an analysis of the characters of *Abrodiaeta modesta*, accompanied by a number of most important sketches of details of the type of that species. From this information it is possible to state what are the essential features of the genus and to correct past misconceptions.

Interested by my inquiry Dr. Capra quite recently has published a full description of this unique type of *Abrodiaeta modesta*,[9] accompanied by the same drawings he so kindly sent me, with a few additional sketches of equal value. From his detailed presentation of the characters of the type species it is now possible to select as generic those features known to be of such value in modern classification. These I have assembled, and present them as a redefinition of the genus, subject, of course, to such future modifications as the development of our knowledge shows to be necessary or warranted.

ALLACTA Saussure and Zehntner

1893. *Abrodiaeta* Brunner, Ann. Mus. Civ. Stor. Nat. Genova, XXXIII p. 21. (Not *Abrodiaeta* Brunner, 1891.)

1895. *Allacta* Saussure and Zehntner, in Grandidier, Hist. Phys. Nat. et Polit. de Madagascar, XXIII, pt. 1, p. 45. (To replace *Abrodiaeta* Brunner.)

GENOTYPE: *Abrodiaeta modesta* Brunner. (By selection of Hebard, 1922.)

[9] Annali Mus. Civ. Stor. Nat. Genova, LV, pp. 5–9, figs. 1–11, (1930).

Generic Characters (from type of *A. modesta*).—Maxillary palpi elongate; third and fourth articles subequal in length; fourth article infundibuliform; fifth article slightly shorter than fourth, subdilated in proximal third. Pronotum trapezoidal; caudal margin truncate. Cephalic femora with ventro-cephalic margin armed distad with three large spines, followed by a series of subequal, short, fine spinulations and four or five large proximal spines placed mesad.[10] Caudal tarsi elongate, compressed; metatarsus longer than the other articles together. Tarsal claws equal, with internal margins unarmed; arolia present. Tegmina (of male) lanceolate; marginal field broad, scapular field broader than discoidal field in distal half of tegmen, anal field pyriform, elongate, equal to nearly half of tegminal length; costal veins of tegmina regular and straight oblique, discoidal sectors oblique. Wings with anterior field broad, rounded distad; costal veins pectinate in disposition, non-clavate,[11] ulnar vein bifurcate or ramose. Dorsal surface of distal abdominal tergites of male unspecialized. Distal tergite of male (supra-anal plate) transverse, subtrigonal, apex rounded. Distal sternite of male (subgenital plate) subtrigonal, asymmetrical, convex ventrad, subrostrate, and compressed distad; apex roundly fissate ventrad of subattingent, internally shagreenous, outwardly reflexed, acute lappet-like angles, bearing very brief styles.

It is evident from these features that *Allacta* is not a member of the group of genera centering about *Mareta* Bolivar. The maretoid genera consistently differ in having unequal tarsal claws and a distinctive and different arrangement of the femoral spination. I have in preparation a comprehensive analysis of the maretoid genera, and the necessity for determining beyond question for this revision the status of *Abrodiaeta* (= *Allacta*) largely prompted the present inquiry.

It is now certain that *Allacta* is more nearly related to the genus *Margattea*, discussed below, than any other known to me. There is some resemblance to *Graptoblatta* Hebard (= *Eoblatta* Shelford, not of Handlirsch), but the equal tarsal claws and oblique discoidal sectors of the tegmina will at once distinguish *Allacta*, and incidentally *Margattea*.

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[10] The type shows four on the left limb, five on right one.

[11] It is evident from Capra's figures (nos. 3 and 4) of the right and left wings of the type of *modesta* that the left wing is abnormal, at least as far as the anterior field is concerned. The very unusual disposition of the costal veins of the left wing and their more orthodox placing in the right wing, as well as the differences in the median and ulnar veins of the two wings, would indicate the left one as the aberrant and the right the normal condition.

MARGATTEA Shelford

1911. *Margattea* Shelford, Entomologist's Monthly Magazine, (2), XXII, p. 155.

The entire original information on this genus is:

Differs from *Neoblattella* in the armature of the front femora; these are armed on the anterior margin beneath with 3 to 5 strong spines succeeded distally by a close-set row of minute piliform spines (Type B).

Type of the genus: *Blatta ceylonica* Sauss.

As will be seen from the above quotation a correct understanding of the genus *Margattea*, so inadequately described, requires a knowledge of the features of *Blatta ceylonica* (= *ceylanica*) Saussure. The brief original description of this species is as follows:[12]

Bl. ceylanica. Minuta gracilis, testacea, vertice, antennis abdomineque superne fuscis; pronoto *elliptico*, planato; disco fusco et testaceo-tessellato; elytris corpore longioribus, testaceo-pellucidis; alis infumatis, venis fuscis, venis costalibus apice tumidis, vena discoidali ramos 2 emittente. ♀.—Long. 8 millim., elytri 10.—Ceylan.

Saussure's later elaboration of this diagnosis, in the Mélanges Orthoptérologiques,[13] is much more comprehensive and with it he presents the specific name in the amended form *ceylonica*. The original, however, should be retained, as it has Latin usage to support the spelling and it is used twice in the original specific description. The Mélanges description, in spite of its much greater length, adds few features which we now consider generic criteria, and, of course, nothing on the structure or proportions of the tarsal claws, the cephalic femoral spination, the direction of the tegminal discoidal sectors or the proportions of the last palpal articles.

As the unique type was a female, nothing was known by Saussure regarding the opposite sex, and no help could thus be derived from primary or secondary sexual features of the male, characters which, broadly interpreted, must be given some generic weight in the Blattidae.

With the need for definite information from the type of *ceylanica* imperative, if the genus *Margattea* was to be correctly interpreted, I approached Mr. J. Carl of the Muséum d'Histoire Naturelle, of Geneva, in which institution repose many of Saussure's types. Dr. Carl, with a courtesy which has placed

[12] Rev. et Magasin de Zool., 2e sér., XX, p. 355, (1868).

[13] Mél. Orth., I, fasc. 2, p. 67, (1869).

me under lasting obligation, transmitted to me a sketch of the armament of the ventro-cephalic margin of the cephalic femora of the type of *ceylanica*, as well as notes from this specimen on certain features which I wished examined. Thus from Saussure's second description and Dr. Carl's notes I am able to give a brief but helpful diagnosis of the genus *Margattea*.

Generic Characters.—Palpi with ultimate article distinctly shorter than penultimate one. Pronotum transverse elliptical. Tegmina (♀) longer than body; scapular field not equal to half of tegminal width. Wings with costal veins distinct and regular, clavate distad. Cephalic femora with ventro-cephalic margin armed distad with two large spines, followed by a series of brief spinules and a proximal group of four large spines (see text-figure 1).[14] Tarsal claws equal, internal margins unspecialized.

Figure 1. Spination of ventro-cephalic margin of cephalic femora of type of *Margattea ceylanica* (*Blatta ceylanica*) (Saussure). From sketch by Dr. J. Carl.

From the features given above it is evident that *Allacta* and *Margattea* have certain features in common, i.e. palpal proportions, tarsal claw development and specializations and general grouping of spine series on the ventro-cephalic margin of the cephalic femora. On the other hand they differ markedly in the pronotal form (which in *Allacta* is not due to tegminal abbreviation, as so often found in the family), in the difference in proportionate width of the tegminal scapular field, in the clavation or non-clavation of the alar costal veins and in the presence of two (*Margattea*) or three (*Allacta*) distal spines on the ventro-cephalic margin of the cephalic femora.

There is no closer affinity of *Margattea* to *Graptoblatta* Hebard (= *Eoblatta* Shelford, not of Handlirsch) than there is of *Allacta* to the latter genus, which relationship has already been discussed.

A number of species have been referred to *Margattea* which we now know to be maretoid, having the unequal tarsal claws and

[14] As is often the case, the number of spines in the proximal group may be found to range from three to five.

largely piliform spinulation of the genera comprising that assemblage. Elsewhere I am correcting some of these inaccurate generic assignments, which were basically responsible for the present inquiry.

It is evident that the true positions of *Allacta* and *Margattea* will be determined only as our knowledge of the numerous Old World genera which have been assigned to the Ectobiinae and Pseudomopinae broadens, and their correct relations thus ascertained. Of these the maretoid genera are moderately cohesive and a critical study of them is now in course of preparation. The grouping of the more extensive and rather heterogeneous series of other genera which have been herded on that indefinite borderland between the Ectobiinae and the Pseudomopinae, but which lack definitely embracing features such as are found in the maretoid genera, is an exceedingly difficult matter. Slowly, however, affinities are becoming apparent and dissimilarities equally evident, so that a natural arrangement of these numerous genera of the Ethiopian and Indo-Malayan regions will be possible. To do this, however, requires marked dismemberment of certain of the old blanket genera which for many decades have been the repositories of scores of species, dumped here and there on account of superficial similarities, and without effort to ascertain less evident but more significant structural features. This course, however, was the general practice of the past, but there can be little excuse for the same method today. The evaluation of numerous structural features will be necessary before we are in a position to suggest, with any chance of finality, a grouping of the numerous genera involved, or the features on which they stand or fall.

The analyses of *Allacta* and *Margattea* here presented may assist in determining the degree of their relationship to one another, but at this writing I do not wish to do more than point out their salient features, and to indicate the necessity for their mutual consideration in any discussion of the Old World genera of this section of the Blattidae.

The illustration of the femoral armament of the type of *Margattea ceylanica* (Saussure), here presented, was made by Dr. Carl. My thanks are due to both Dr. Capra and Dr. Carl for their kind assistance, which made these comments possible.

CUBAN HESPERIIDAE

(LEPIDOPTERA)

BY R. C. WILLIAMS, JR.

(Colored plate XXVII and text figures)

Mr. Orazio Querci has recently returned from eleven months collecting in Cuba. The trip was financed by Mr. Andrew Gray Weeks of Boston, Mr. Frank Johnson of New York, and the writer. The butterflies went to Mr. Weeks, the moths to Mr. Johnson, and I received the Hesperiidae. Many of the butterflies in exchange for duplicate Hesperiidae are in the collection of The Academy of Natural Sciences of Philadelphia. Mr. Johnson has presented the Academy with the majority of the moths, some 3500 insects, and good series of the species are in the Academy's collection.

Mr. Querci began collecting the first of November 1929 and left the first of October 1930. Shortly after his arrival with Mrs. Querci he was joined by his daughter Mrs. Romei and his granddaughter Lycaena. He made his headquarters at Cristo, and most of the collecting was done in this neighborhood in the foothills of the Sierra Maestra Mountains of Eastern Cuba. His family assisted him in collecting, they were in the field every day, and therefore their catch represents all of the Lepidoptera that were on the wing during their sojourn. From July 5th to 20th Mr. Querci and his daughter travelled east, making some captures on the Turquino River and ascended the Turquino Mass to a height of 4000 feet, but during this period the others of his family were at Cristo continuing the collecting.

The accompanying table gives the emergence of the thirty-six species of Hesperiidae collected by him week by week, and except in the case of extreme rarities, refers to fresh specimens. From this table and Mr. Querci's observations it would seem that there are two periods of principal emergence, namely from November until the 15th of December when the individuals became scarce, and again from the end of May through June and July, again becoming scarce in August and September. Mr. Querci believes

	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.
PHOCIDES BATABANO LUC.	♀					♀					♂
EUDAMUS SANTIAGO LUC.	♀♂♀♂♀	♀♂♀♂♀	♀♂♂♀	♀	♀♂		♂♀	♀♂♀♂♀	♀♂♂♂♀♂	♀	♂ ♀
" PROTEUS LIN.	♀♂♀♂♀	♂♀♂♀♂	♀	♂♀	♀ ♂		♂	♀♂♀♀♂	♂♀♂♀♂	♀♂♀♀	♀♂♀♂♀
EPARGYREUS MAYSI LUC.									♀		
PROTEIDES SANANTONIO LUC.	♀♂		♀			♂♀	♀	♂♀♂♀	♀♂	♀♂ ♂	♂♂♀♂♀
POLYGONUS LIVIDUS HUB.	♂♀♂♀	♂ ♂		♀	♀♂			♀♂♀♀♀	♂	♂♂	♂♂♀♀♀
TELEGONUS HABANA LUC.	♂♀♂♀	♂♀♂♀	♀♂		♀	♂♀		♀♀	♀	♂ ♂	♀♂♀♂♀
" XAGUA LUC.								♂			
" CUBANA MAB-BOUL.											♂
" JARIBA BUT.									♀		
" TALUS CRAM.							♂				
EPHRIADES ZEPHODES HUB.	♂♀				♀♂	♂♀		♀♂♂♀	♂ ♀	♀	
" ARCAS DRU.									♂		♂
CABARES POTRILLO LUC.	♂	♂							♀		♀
STAPHYLLUS BRACO HER-SCH.									♂		
EANTIS PAPINIANUS POEY	♀♂♂	♂ ♂♂	♂			♀			♀ ♂♀	♂	♀♀♂
ERYNNIS ZARUCCO LUC.	♂♀	♀♀♀	♂♀		♀	♂		♀♀♀	♂ ♂	♂	♀♂ ♀
" GESTA HER-SCH.	♂♀♂♀♂	♂♀♂♀♂	♂♀♂♂♀	♀♂♂	♀♂	♂♂♂	♂♀♂	♂♀♂	♂	♀	♀♂♂♂♂
PYRGUS SYRICHTUS FAB.	♀♂♀♂♀	♂♀♂♀♂	♂♀ ♂♀	♀♂♂♂	♂	♀	♀♂♂	♂♀♂♀	♀♂♂♂♂	♂♂♀	♂♂♀♂♀
" CRISIA HER-SCH.									♀♂		
HYLEPHILA PHYLAEUS DRU.	♂♀♂♂♀	♂♀♂♀♂	♀ ♂	♀	♂		♀♂	♂♂♀♂	♀	♂♂	♀♂♂♀♂
ADOPAEA MAGDALIA HER-SCH	♂♀♂♀♂	♂	♂♂		♂	♂		♂	♂	♂♀♂♀♂	♂♀♂♀♂
POLITES BARACOA LUC.	♂♀♂♀♂	♂♀♂	♀	♂♀♂♂♂	♂	♀♂	♂♂♀♂	♂♀♂♀♂	♂♀♂♀♂	♂♂♂♂♂	♀♂♀♂♂
ATALOPEDES MESOGRAMMA LAT.	♀♂	♂♂	♂	♂♂♀	♂	♂♀	♂	♀♂♀♂	♂	♂	♂ ♂
LERODEA EUFALA EDW.	♂	♂♀	♂♀♂♀	♂				♀	♀♂ ♂	♂♀♂♀	♀♀♀
MEGISTIAS TRIPUNCTUS HERSCH	♀♂♀♂♀	♂♀♂♀♂	♂♀♂♂			♀	♀♂♀	♂♀♂		♂♀♂♀♂	♂♀♂♀♂
CATIA MISERA LUC.	♂♀♂♂	♂ ♂♀	♂♀♀	♂♂♂	♂	♀♂♀	♀♂♂♂	♂♀	♂♀♂♀♂	♀♂♀♂♂	♀♂♂♂♂
TIGASIS CORNELIUS LAT.			♂					♀♂	♂	♂	♂♂
PYRRHOCALLES ANTIQUA HERSCH										♂	
CHORANTHUS RADIANS LUC.	♀♂	♂♂	♂		♂ ♂	♂	♂♀♂	♂ ♂	♂	♂♂♀	♂♀♂♀
PRENES SYLVICOLA HER-SCH.	♀♂♀♂♀	♂♀ ♀	♀ ♀				♀♂♀♀♀	♂♀♂♀		♀♂♂	♀♂
" NYCTELIUS LAT		♂				♂	♀♂	♀♂♀♂♀	♂ ♀		♀♀
" CORRUPTA HER-SCH.										♂♂	
ASBOLIS CAPUCINUS LUC.	♂ ♂	♂♂			♂♀		♂♀♂♂		♀	♀	♀ ♂
PERICHARES CORIDON FAB.	♀ ♀	♀♀♂	♂				♀				♀♂
GODMANIA MALITIOSA HER-SCH.									♀♂		♀

that during the months of February, March, April and into the middle of May these insects become lethargic, this period in Cuba corresponding to our winter. On December 15th he marked a large quantity of the abundant skippers by clipping the wings and these he saw flying until January when they all disappeared, some however, reappearing at the end of May. One individual, a *radians* marked in December, was recaptured in August. He is also of the opinion that the collecting in general during his stay on account of weather conditions, was unusually poor.

Attention is called to the excellent paper by Skinner and Ramsden, being an "Annotated List of the Hesperiidae of Cuba."[1] Querci's catch did not include any species additional to this list.

In the following list I will indicate the abundance of the species collected, give references to the best published figures of the species, and figures of the male genitalia, and some notes on the nomenclature, etc., which may add to our knowledge of the Cuban Fauna. I am figuring the male genitalia of those species which have not previously been figured, and colored figures of the more obscure species or those which have not previously been adequately shown. These latter were made from paintings by Miss Helen Winchester, the Academy's artist.

1. **Phocides batabano** (Lucas)

1911. *Phocides batabano* Skinner, Tr. Am. Ent. Soc., XXXVII, pl. 10.
1922. *Phocides batabano* Skinner and Williams, Tr. Am. Ent. Soc., XLVIII, p. 111, fig. 2, (♂genitalia).

Nov. 20, 1 ♀; Apr. 9, 1 ♀; Sept. 7, 2 ♂; all worn specimens.

2. **Eudamus santiago** Lucas

1916. *Eudamus santiago* Holland, Ann. Carnegie Mus., X, pl. 31, fig. 6.

Abundant. A few specimens like typical *Papilio dorantes* Stoll of which I believe *santiago* to be a Cuban race. The male genitalia of *santiago* are the same as those of *dorantes*.[2]

3. **Eudamus proteus** (Linné)

1922. *Eudamus proteus* Skinner and Williams, Tr. Am. Ent. Soc., XLVIII, p. 114, fig. 10 (♂ genitalia).

Abundant. There are many good figures of *proteus*. In the Cuban form the hyaline spots are smaller than in the continental form.

[1] Proc. Acad. Nat. Sci. Phila., LXXV, p. 307, 1923.
[2] Tr. Am. Ent. Soc., XLVIII, p. 115, fig. 11, 1922.

4. **Epargyreus maysi** Lucas

1916. *Epargyreus maysi* Holland, Ann. Carnegie Mus., x, pl. 31, figs. 11, 12.

One ♀ Turquino Mass., 3000 ft. elev. July 10. In this individual the subapical dots on the superior wings above are absent and on the costa there is but one spot, reduced. On the inferior wing below there are two silver spots, the upper one small, the lower one larger, divided into three parts by the veins. I believe it to be a Cuban form of *Papilio exadeus* Cramer, in which the hyaline spots on the superior wing are greatly reduced. The male genitalia of *maysi* are the same as those of *exadeus*.[3]

5. **Proteides san-antonio** (Lucas)

1916. *Photeides sanantonio* Holland, Ann. Carnegie Mus., x, pl. 31, figs. 1, 2.

Rare. This I believe to be the Cuban race of *mercurius* Fabricius (*idas* Cramer, not Linné). The male genitalia of *san-antonio* are the same as those of *mercurius*.[4]

6. **Polygonus lividus** Hübner

1911. *Polygonus amyntas* Skinner, Tr. Am. Ent. Soc., xxxvii, pl. 10.

1922. *Polygonus amyntas* Skinner and Williams, Tr. Am. Ent. Soc., xlviii, p. 113, fig. 5 (♂ genitalia).

Common.

7. **Telegonus habana** (Lucas)

1922. *Telegonus habana* Draudt, Seitz Macrolep., v, pl. 167 d.

1927. *Telegonus habana* Williams, Tr. Am. Ent. Soc., liii, p. 284, fig. 27 (♂ genitalia).

Rather rare.

8. **Telegonus xagua** (Lucas)

1927. *Telegonus xagua* Williams, Tr. Am. Ent. Soc., liii, pl. 24, fig. 7; p. 282, fig. 26 (♂ genitalia).

1 ♂, June 19.

9. **Telegonus cubana** Mabille and Boullet

1927. *Telegonus cubana* Williams, Tr. Am. Ent. Soc., liii, pl. 24, fig. 5.

One worn ♂, September 26. I believe *cubana* to be the Cuban form of *Papilio anaphus* Cramer, the male genitalia[5] of which are the same.

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[3] Tr. Am. Ent. Soc., xlviii, p. 114, fig. 9, 1922 and liii, p. 262, figs. 1, 2, 1927.

[4] Tr. Am. Ent. Soc., xlviii, p. 113, fig. 6, 1922.

[5] Tr. Am. Ent. Soc., liii, p. 283, fig. 23, 1927.

10. **Telegonus jariba** (Butler)

1874. *Aethilla jariba* Butler, Exot. Lep., pl. 40, fig. 3.
1927. *Telegonus jariba* Williams, Tr. Am. Ent. Soc., LIII, p. 282, fig. 25 (♂ genitalia).

One worn male, Turquino river, July 16.

11. **Telegonus talus** (Cramer)

1917. *Telegonus talus* Draudt, Seitz Macrolep., V, pl. 166d [rather large figure].
1927. *Telegonus talus* Williams, Tr. Am. Ent. Soc., LIII, p. 268, fig. 7 (♂ genitalia).

1 ♂, May 29.

12. **Ephyriades zephodes** (Hübner)

1806–16. *Oleides zephodes* Hübner, Saml. Exot. Schmet., II, pl. 364, figs. 1–4.
1916. *Melanthes otreus* var. *brunnea* Holland, Ann. Carnegie Mus., X, pl. 31, figs. 3 (♂), 4 (♀), 5 (♂).
1923. *Ephyriades zephodes* Skinner and Williams, Tr. Am. Ent. Soc., XLVIII, p. 302, fig. 26 (♂ genitalia).

Rare. I believe that all of the females caught by Mr. Querci are of this species. While there is some variation as in the original Hübner plate, they should all be associated with the males of *Nisoniades brunnea* Herrich-Schäffer[6] and not with *Papilio arcas* Drury.

13. **Ephyriades arcas** (Drury) (fig. 1. ♂ genitalia)

1773. *Papilio arcas* Drury, Ill. Exot. Ent., I, pl. 19, figs. 5, 6.

1 ♂, Cristo, September 18. 2 ♂, Turquino River, July 17.

14. **Cabares potrillo** (Lucas)

1863. *Thanaos paterculus* Herrich-Schäffer, Corres. Blat. Regensb., XVII, p. 141.
1894. *Cabares potrillo* Godman and Salvin, Biol. Cent. Am., II, pl. 80, figs. 24, 25.
1922. *Cabares potrillo* Skinner and Williams, Tr. Am. Ent. Soc., XLVIII, p. 127, fig. 24 (♂ genitalia).

Rare.

Skinner and Ramsden place *paterculus* as a Venezuelan insect but their quotation on which they base this assumption is incorrect in that it is not from the original description, but appears a few pages before in reference to *potrillo*. The description itself refers directly to a specimen sent to Herrich-Schäffer from Cuba

[6] Corres. Blat. Regensb., XVII, p. 141, 1863.

Fig. 1. *Ephyriades arcas* Drury. 2. *Staphylus braco* Herrich-Schäffer. 3. *Eantis papinianus* Poëy. 4. *Pyrgus crisia* Herrich-Schäffer. 5. *Adopaea magdalia* Herrich-Schäffer.

by Gundlach, and applies to the female of *potrillo* and not at all to *Achlyodes zera* Butler,[7] which has been placed as a synonym of *paterculus* and figured under that name by Draudt.[8]

There is in the Academy collection a single insect bearing the number 55 by Poey's hand and listed in Poey's manuscript catalog unidentified; this same number in Gundlach's manuscript catalogue is given the name *paterculus*. This insect, undoubtedly a topotype of Herrich-Schäffer's *paterculus* and, corresponding almost exactly with the Herrich-Schäffer description, is actually a rather large and well marked female of *potrillo*, so *paterculus* should fall and Butler's name *zera* should be used for the Venezuelan Hesperid, which does not occur in Cuba at all.

15. **Staphylus braco** (Herrich-Schäffer) (Pl. XXVII, figs. 13 and 15; fig. 2, ♂genitalia.)

1864. *Nisoniades braco* Herrich-Schäffer, Corres. Blat. Regensb., XVIII, p. 171, (♂).

1864. *Nisoniades undulatus* Herrich-Schäffer, Corres. Blat. Regensb., XVIII, p. 172, (♀).

1884. *Nisoniades isabellina* Plötz, Jahrb. Nass. Ver. Nat. Wiesbaden, XXXVII, p. 37.

Rare.

This is not the insect figured by Draudt[9] and ascribed to Plötz. I can find no description of *braco* Plötz, but he puts his *isabellina* (Prittwitz ms.) under *braco* Herrich-Schäffer (t. 1052). *Braco* and *undulatus* are the two sexes.

16. **Eantis papinianus** (Poey) (Fig. 3, ♂ genitalia.)

1832. *Hesperia papinianus* Poey, Cent. Lep. Cuba, text and plate.

1923. *Eantis papinianus* Draudt, Seitz Macrolep., V, pl. 176 c. [A rather poor figure].

Rare.

17. **Erynnis zarucco** (Lucas)

1898. *Thanaos naevius* Holland, But. Book, pl. 48, fig. 3, ♀.

1914. *Thanaos terentius* Skinner, Tr. Am. Ent. Soc., XL, p. 213 (fig. ♂ genitalia).

Rare. A further series of *zarucco* from Cuba confirms the opinion of Skinner and Williams[10] that *terentius* Scudder and Burgess and *naevius* Lintner fall to *zarucco*, the oldest name.

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[7] Tr. Ent. Soc. London, p. 514, 1870.

[8] Seitz Macrolep., V, pl. 173 d, 1922.

[9] Seitz Macrolep., V, 900, Pl. 175 i, 1922.

[10] Tr. Am. Ent. Soc., L, p. 204, 1924.

18. **Erynnis gesta** (Herrich-Schäffer)

1899. *Chiomara gesta* Godman and Salvin, Biol. Cent. Am., II, p. 455, pl. 91, figs. 7, 8.

1923. *Thanaos gesta* Skinner and Williams, Tr. Am. Ent. Soc., XLVIII, p. 305, fig. 28 (♂ genitalia).

Abundant.

19. **Pyrgus syrichtus** (Fabricius)

1930. *Pyrgus syrichtus* Williams and Bell, Tr. Am. Ent. Soc., LVI, p. 133, pl. 8, fig. 1 (♂ genitalia).

Abundant. The reference cited above gives a comparison with the allied species *Papilio orcus* Cramer.[11] It is quite probable that one of the Cuban forms of this somewhat variable species, is the typical one.

Those with the hind wings beneath black and white emerge in dry weather, those suffused with brown (cinereus of the original description) emerge in wet weather, and this holds true for some three hundred freshly emerging insects captured during the eleven months period. Both forms are common and the type name of Fabricius may apply to the suffused form and not to the black and white form as now usually applied.

Some specimens from Arizona (*montivagus* Reakirt) and some from Key West Florida (*fumosa* Reverdin) show a brown-red tint in this suffusion considerably stronger than in our series of the Cuban insect. This extreme suffusion is well shown in the Culot figure in the plate accompanying Reverdin's paper.[12]

20. **Pyrgus crisia** (Herrich-Schäffer) (Pl. XXVII, figs. 7 and 9; ♂ genitalia fig. 4.)

1923. *Hesperia montivagus* form *crisia*, Draudt, Seitz Macrolep., V, pl. 178k. [A very poor figure].

Very rare and local in a marsh near Cristo. It is a very distinct species.

21. **Hylephila phylaeus** (Drury)

1898. *Hylephila phylaeus* Holland, But. Book, pl. 46, figs, 18 (♂), 19 (♀).

1924. *Polites phylaeus*, Skinner and Williams, Tr. Am. Ent. Soc., L, p. 146, fig. 6 (♂ genitalia).

Abundant.

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[11] Pap. Exot., IV, 87, pl. 204, figs, I, K and L, 1782.

[12] Bull. Soc. Lep. Geneve, IV, p. 106, pl. iv, fig. 2, 1919.

22. **Adopaea magdalia** (Herrich-Schäffer) (♂ genitalia fig. 5.)

1924. *Thymelicus magdalia* Draudt, Seitz Macrolep., v, p. 931, pl. 181 f. [A poor figure].

Abundant.

23. **Polites baracoa** (Lucas)

1916. *Limochares baracoa* Holland, Ann. Carnegie Mus.; x, pl. 31, fig. 15 (♂).

1924. *Polites baracoa* Skinner and Williams, Tr. Am. Ent. Soc., L, p. 154, fig. 15 (♂ genitalia).

Abundant.

24. **Atalopedes mesogramma** (Latreille) (♂ genitalia fig. 6.)

1916. *Atalopedes mesogramma* Holland, Ann. Carnegie Mus., x, pl. 31, fig. 14, (♀).

Rare.

25. **Lerodea eufala** (Edwards)

1868. *Hesperia eufala* Edwards, Tr. Am. Ent. Soc., II, p. 311.

1869. *Gomiloba dispersa* Herrich-Schäffer, Corr. Blat., Regensb., XXVIII, p. 197.

1876. *Pamphila floridae* Mabille, Bull. Soc. Ent. France, 1876, p. 9.

1878. *Carystus micylla* Burmeister, Des. Phys. de la Rep. Arg., v, p. 272.

1881. *Cobalus dispersus* Gundlach, Cont. Ent. Cuba, I, p. 154.

1904. *Lerodea eufala floridae* var. *obscura* Mabille, Wytsman, Gen. Ins., Hesp., p. 131.

1911. *Carystus mycilla* Giacomelli, Ann. Soc. Cien. Arg., LXXII, p. 251.

1923. *Lerodea eufala*, Skinner and Williams, Tr. Am. Ent. Soc., XLVII, p. 146, fig. 35 (♂ genitalia).

1927. *Lerodea eufala* Comstock, But. of California, p. 226, pl. 62, figs. 14, 15, 16.

Rare. The Cuban form is practically the same as the continental insect. This little species is somewhat variable but always quite distinct from *tripunctus* a similar species with which it flies.

26. **Megistias tripunctus** (Herrich-Schäffer)

1876. *Pamphila ancus* Möschler, Verh. Zool. Bot. Ges. Wien., XXVIII, p. 214. (Colombia.)

1886. *Hesperia conta* Plötz, Ent. Zeit. Stet., XLVII, p. 95. (Minas Geraes.)

1902. *Megistias jamaca* Schaus, Proc. U. S. Nat. Mus., XXIV, p. 452. (Jamaica.)

1923. *Lerodea tripunctus*, Skinner and Williams, Tr. Am. Ent. Soc., XLIX, p. 148, fig. 38 (♂ genitalia).

1924. *Megistias tripunctus*, Draudt, Seitz Macrolep., v, p. 974, pl. 187 k. [Poor figure].

Abundant.

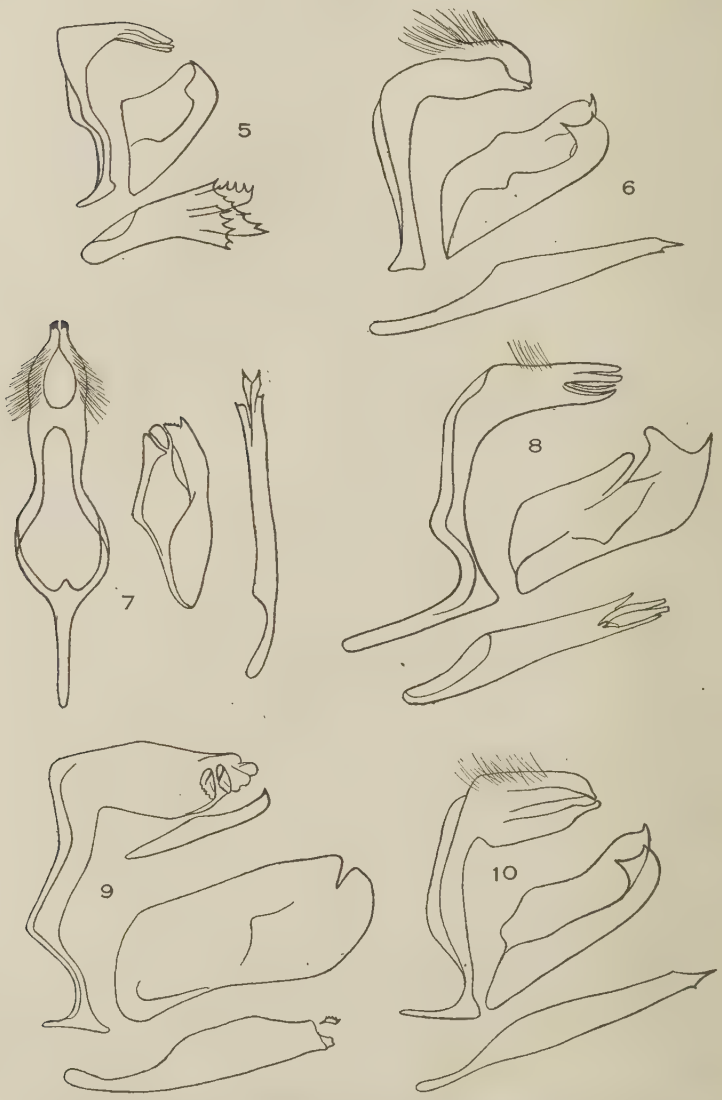

Fig. 6. *Atalopedes mesogramma* Latreille. 7. *Catia misera* Lucas. 8. *Tigasis cornelius* Latreille. 9. *Pyrrhocalles antiqua* Herrich-Schäffer. 10. *Prenes corrupta* Herrich-Schäffer.

27. **Catia misera** (Lucas) (♂ genitalia fig. 7.)

1924. *Catia misera* Draudt, Seitz Macrolep., v, pl. 181 e. [A poor figure].

Abundant.

28. **Tigasis cornelius** (Latreille) (♂ genitalia fig. 8.)

1916. *Amblyscirtes insulae-pinorum* Holland, Ann. Carnegie Mus., x, pl. 31, figs. 7 (♂), 8 (♀).

1869. *Goniloba hemeterius* Herrich-Schäffer, Corr. Blat. Regensb., XXIII, p. 196.

1923. *Tigasis hemeterius* form *godmani* Draudt, Seitz Macrolep., v, p. 963.

1926. *Goniloba hemelerius* Riley, Tr. Ent. Soc. London, LXXIV, p. 236.

Very rare.

Godmani is an individual from Cuba without white spots on the secondaries below. These spots are variable as indicated in the original description which mentions an immaculate female. The tendency, however, for these spots to become obsolescent or obsolete seems to be more prevalent in the males in our series, and the name is hardly worthy of retention.

29. **Pyrrhocalles antiqua** (Herrich-Schäffer) (♂ genitalia fig. 9.)

1 ♂, Turquino River, July 18. This individual is of the form *orientis* Skinner.[13] I have not, however, seen sufficient material to know if the eastern and western forms on the Island of Cuba are sufficiently distinct to warrant the retention of racial names.

30. **Choranthus radians** (Lucas) (Pl. XXVII, figs. 1, 3, 4, 6.)

1924. *Choranthus radians*, Skinner and Williams, Tr. Am. Ent. Soc., L, p. 61, fig. 9 (♂ genitalia).

There is some little variation in the amount of the black, in the width of the borders and the extra-cellular markings in the male. The females are even more variable; *ammonia* Plötz,[14] is a female form in which the fulvous is very much reduced, and *bellus* Draudt,[15] is the extreme in which the fulvous is entirely gone.

31. **Prenes sylvicola** (Herrich-Schäffer)

1923. *Prenes sylvicola* Draudt, Seitz Macrolep., v, pl. 183 i.

1923. *Prenes sylvicola*, Skinner and Williams, Tr. Am. Ent. Soc., XLIX, p. 150, fig. 41 (♂ genitalia).

Abundant.

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[13] Ent. News, XXXI, p. 152, 1920.

[14] Ent. Zeit. Stet., XLIV, p. 201, 1883.

[15] Seitz Macrolep., v, p. 941, pl. 182 k, 1924.

32. **Prenes nyctelius** (Latreille)

1900. *Prenes ares* Godman, Biol. Cent. Am. Rhop., II, 510, pl. 96, figs. 10, 11.
1923. *Calpodes coscinia* Skinner and Williams, Tr. Am. Ent. Soc., XLIX, p. 152, fig. 43 (♂ genitalia).

Rare.

I am using the Latreille name on the authority of Riley, who believes it is the same insect as *Hesperia ares* Felder.

33. **Prenes corrupta** (Herrich-Schäffer) (♂ genitalia fig. 10.)

1916. *Prenes corrupta* Holland, Ann. Carnegie Mus., X, p. 509, pl. X, fig. 13.

2 ♂, August 15 and 30.

34. **Asbolis capucinus** (Lucas) (♂ genitalia fig. 11.)

1916. *Asbolis sandarac* Holland, Ann. Carnegie Mus., X, pl. 31, fig. 9 (♀).

Rare.

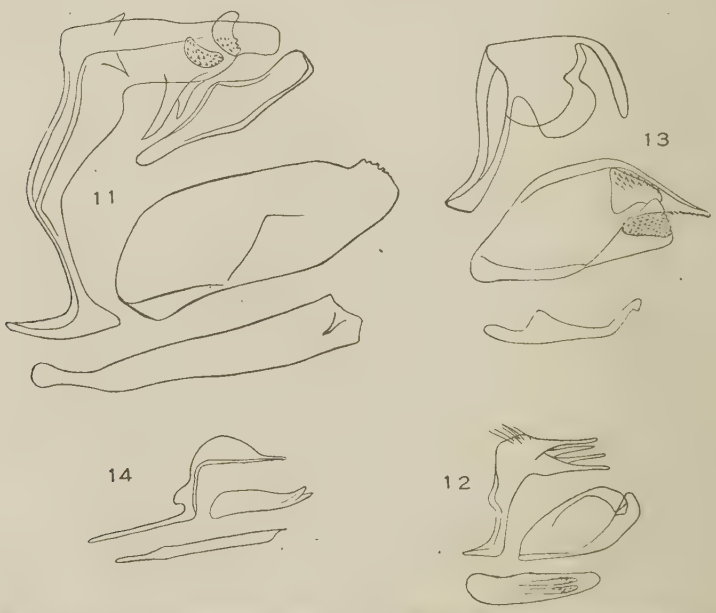

Fig. 11. *Asbolis capucinus* Lucas. 12. *Godmania malitiosa* Herrich-Schäffer. 13. *Staphylus concolor* Herrich-Schäffer. 14. *Ancyloxypha nanus* Herrich-Schäffer.

35. **Perichares coridon** (Fabricius)

1901. *Perichares corydon* Godman, Biol. Cent. Am., Rhop., II, p. 631, pl. 106, fig. 14 (♂), 15 (♂ genitalia).

Rare.

36. **Godmania malitiosa** (Herrich-Schäffer) (Pl. XXVII, fig. 10, 12; ♂ genitalia fig. 12.)

1901. *Cymaenes malitiosa* Godman, Biol. Cent. Am., Rhop., II, pl. 102, figs. 41, 42, 43 (♂ genitalia).

The Godman figure shows the underside only and the markings are exagerated, our series show these markings more obscure and the lower wing much more uniformly brown in color; the size is rather large. The male has a band in the superiors of a sordid fulvous color across the disk. In the female this band is obsolescent or obsolete.

On Some Cuban Species not Collected by Mr. Querci

Staphylus concolor (Herrich-Schäffer) (Pl. XXVII. figs, 2. 5; ♂ genitalia fig. 13.)

This species is incorrectly placed under *Thanaos juvenalis* Fabricius by Draudt.[16] Skinner and Ramsden place it in the genus *Bolla*, which Godman and Salvin united with *Staphylus* where I prefer to leave it for the present although the male has no costal fold.

There is in the Academy collection a male from the Poey collection which is undoubtedly a topotype, and a series of eight males and three females collected by Ramsden at or near Guantanamo. The three apical dots in the male are usually reduced to two and are sometimes entirely absent. In the female there are one or two additional spots beyond and below the end of the cell.

Chiomara mithrax (Möschler)

1878. *Achlyodes mithrax* Möschler (Herrich-Schäffer Ms.), Verh. Zool. Bot. Ges. Wien, XXVIII, p. 225. (♂; Colombia.)

1884. *Achlyodes noctula* Plotz (Hopffer MS.), Jahrb. Nass. Ver. Nat. Wiesbaden, XXXVII, p. 15. (Para.)

1899. *Chiomara mithrax* Godman and Salvin, Biol. Cent. Amer., Rhop., II, p. 454, pl. 91, figs. 4, 5, and 6 (♂ genitalia).

[16] Seitz Macrolep., V, p. 916, 1923.

1923. *Cyclogypha gundlachi* Skinner and Ramsden, Proc. Acad. Nat. Sci. Phila., LXXV, p. 314. (♀; Guantanamo, Cuba.)
1923. *Chiomara mithrax* Draudt, Seitz Macrolep., V, p. 913, pl. 177 i.

The type of *gundlachi*, in the Academy collection is a distinctly marked female of *mithrax*. There are also specimens in the collection from Brazil, Paraguay and Bolivia showing very little variation.

Ephyriades cubensis Skinner (Pl. XXVII, fig. 8, type.)
1913. *Ephyriades cubensis* Skinner, Ent. News, XXIV, p. 72.

This was described from a single female from Yberia, Cuba. I suspect it to be the female of *arcas* Cramer, and there are a number of points of resemblance between the two that would lead to this conclusion. In addition to the type of *cubensis*, there are in the collection of the Academy two others without adequate data showing slight variation in the size and number of the hyaline spots as might be expected and as is the case with the females of *zephodes* Hübner.

Ancyloxypha nanus (Herrich-Schäffer) (Pl. XXVII, fig. 14; ♂ genitalia fig. 14.)

There are in the Academy collection two male topotypes from the Gundlach collection, and four collected by Ramsden at Pinares de Mayari, Sierra de Nipe. If abundant it must be very local.

Paracarystus cubana (Herrich-Schäffer) (Pl. XXVII, fig. 11.)

This species has been incorrectly placed under *Cobalus quadrangula* Plötz, by Draudt[17] probably based on a statement by Godman that it is like *Hesperia quadrangula* Plötz. The single specimen in the Academy is from the Poey collection and a topotype. The pointed fore-wings show it to be closely related to the species of the genus *Prenes*.

[17] Seitz Macrolep., V, p. 959, 1923.

Explanation of Plate XXVII

Fig. 1. *Choranthus radians* Lucas. ♂.
Fig. 2. *Staphylus concolor* Herrich-Schäffer. ♂.
Fig. 3. *Choranthus radians* Lucas. ♀.
Fig. 4. *Choranthus radians* form *ammonia* Plötz. ♂.
Fig. 5. *Staphylus concolor* Herich-Schäffer. ♀.
Fig. 6. *Choranthus radians* form *ammonia* Plötz. ♀.
Fig. 7. *Pyrgus crisia* Herrich-Schäffer. ♂.
Fig. 8. *Ephyriades cubensis* Skinner. ♀ type.
Fig. 9. *Pyrgus crisia* Herrich-Schäffer. ♀.
Fig. 10. *Godmania malitiosa* Herrich-Schäffer. ♂.
Fig. 11. *Paracastus cubana* Herrich-Schäffer. ♀ topotype.
Fig. 12. *Godmania malitiosa* Herrich-Schäffer. ♀.
Fig. 13. *Staphylus braco* Herrich-Schäffer. ♂.
Fig. 14. *Ancyloxypha nanus* Herrich-Schäffer. ♂.
Fig. 15. *Staphylus braco* Herrich-Schäffer. ♀.

WILLIAMS—CUBAN HESPERIIDAE

A NEW FORM OF SPHINX GORDIUS (CRAMER)

(LEPIDOPTERA: SPHINGIDAE)

BY JOHN W. CADBURY 3D

(Plate XXVIII)

Sphinx gordius form **coxeyi** new form

This form is much darker and more suffused with black than in typical *gordius*. The markings of the forewing, although very similar, are less distinct and clear cut. The gray band of the lower wing is more sagittate, and is straighter, where that of *gordius* is more distinctly undulate. The underside of the wings in *coxeyi* shows but faint indication of the clearcut bands, and none of the curved apical portion of the disto-medial band. Where the body of *gordius* is white, *coxeyi* is dark gray and the posterior half of the underside of the abdomen is very dark; in *gordius* it is light.

♀. The head is brownish gray with a sooty stripe running from between the antennae to the tongue, and a gray band runs between the eye and antenna, back to the base of the forewing. A sooty pleural line runs through the eye to the base of the hindwing.

The thorax above is black with a distinct median tuft of gray hairs; the patagiae are pure black with a white lateral stripe. The underside of the thorax and base of abdomen are grayish, becoming grayish black at the tip of latter, without mesial streaks or spots. The abdomen above, dark gray with a faint black dorsal streak running the whole length and three alternate gray and black bands on each side.

Wings, upperside.—Forewings suffused smoky black with some grayish white scaling concentrated on the terminal area and thickening toward the apex. A black spot exists just below the costal vein immediately before the apex, and a very thin black line runs obliquely from the extreme apex for a distance of ten mm. and is then sharply bent at vein SC1. A wavy black line, distally bordered with white, runs from the interspace between R2 and R3 to SM1, about three mm. in from the terminal margin. The discal area is brownish black and the pen marking is present but indistinct due to the dark ground color. There is practically no white scaling on the basal two-thirds of

the wing, and the white stigmatical spot at the end of cell although small is quite distinct. Where they have not been rubbed the veins are defined with black scaling. Fringe white with brownish black spots at the end of the veins.

Ground color of hind wings dirty gray with a median band and terminal area black, the latter distinctly serrated proximally, with the apices of teeth in the interspaces; the intermediate gray band is straight with undulation slightly indicated. Fringe as in the forewing.

Wings, underside.—That of the forewings is dark gray with no distinct banding, but there is a suffused patch of whitish scaling on the terminal area near the apex through which the thin oblique line from the apex is faintly indicated.

The underside ground color of hindwing is the same as that of the forewing, dark gray, with the whitish areas of the upperside faintly duplicated, but the dark terminal area is not serrate.

Expanse, 70 mm. Length of forewing from base to apex, 35 mm. Length of hindwing from base to apex, 22 mm.

This form is named for its collector, Mr. W. Judson Coxey, who took the single type specimen, a female, on Greenly Island, Labrador, in August; and is deposited by him in the Collection of the Academy of Natural Sciences of Philadelphia.

Explanation of Plate XXVIII

(All figures full size)

Fig. 1.—*Sphinx gordius*, upper side.

Fig. 2.—*Sphinx gordius*, lower side.

Fig. 3.—*Sphinx gordius* form *coxeyi* new form, upper side.

Fig. 4.—*Sphinx gordius* form *coxeyi* new form, lower side.

CADBURY—AMERICAN SPHINGIDAE

SOME NOTES ON MY REVISION OF THE RHAGIONIDAE (DIPTERA)

BY MORTIMER D. LEONARD

Insular Experiment Station, Rio Piedras, Porto Rico

In May 1930 there was published my paper entitled "A revision of the dipterous family Rhagionidae (Leptidae) in the United States and Canada."[1] I have since that time received several corrections to typographical errors and some notes and criticisms from well-known Dipterists which I think it well worth while to put on record.

On page 11 in the key to the species of *Rachicerus* the second alternative of first couplet should run to 2, not 4; and the first alternative of the second couplet should run to 3, not 2, and the second alternative to 4, not 3. Briefly, change 4 to 2, 2 to 3, 3 to 4.

On page 22, line 14 from the top should read "*Xylophagus triangularis* Say."

Under date of July 27, 1930 Mr. Jas. E. Collins, Raylands, Newmarket, England, pointed out the following errors which I hereby correct:

On page 55 the reference number at the end of the third line of the key should read "3" instead of "10."

On page 67, lines 8 and 9 from the bottom should read "The first antennal segment may be blackish, however, and the hind legs with less blackish, especially on the tibiae;"

On page 82, line 21 from the bottom should read "the hind femora and metatarsi of the male."

Mr. Collins was also kind enough to furnish me with the following notes and comments on Bigot's types:

Dialysis dispar, (under male) 4 specimens of *dispar* and 1 of *?rufithorax;* (under female) ♂ ♀ on one pin and 2 ♀ of *?rufithorax*.

(N.B. I think these *?rufithorax* are not dark enough for *lauta*.)

[1] (Mem. Am. Ent. Soc. No. 7, 181 pp., 3 pls., 1930).

Hilarimorpha obscura. A distinct species of Hilarimorpha with very short style, basal segment not longer than wide and not longer than the bristle-like second segment.

Leptis albibarbis. Abdomen hardly marked at all on first three segments. Third antennal segment small and short with upper side concave. Can hardly be your *concavus* because of entirely yellow femora.

Leptis hoodianus. Bigot's description of abdomen applies better to female than to male. On second and third segments in male there is an elongate median dark mark (broader on third segment) hardly connected at base on second segment with the dark basal side patches, but more distinctly so connected on third segment. Third antennal segment longer than in *albibarbis* but also somewhat concave above.

Leptis maculifera. Three distinct species. Four males of one and an odd male of the other two species. The two odd males do not answer to Bigot's description (one having black-haired palpi and the other being much too small) so may be ruled out as types. The four males may be the same species as your *maculifer* but I note that description of abdominal pubescence given in your table of species does not agree with that given on page 105.

Leptipalpus limbipennis is probably the female and *L. obscuripennis* the male of *Chrysopilus quadratus.* [I think we can therefore relegate these two species to synonymy.—M. D. L.]

Leptis pruinosus = *Arthroceras pollinosum* Will.

Chrysopilus anthracinus. Antennae almost bare, only palpi with long black hairs, face bare at sides, long hairs on abdomen brownish-black but there are indications of shorter, more appressed, scattered, golden hairs.

Chrysopilus testaceipes. Your interpretation probably correct.

Chrysopilus flavidus. I question the synonymy of this with *quadratus.* It is an entirely yellow species without distinct darkened band across wings. [It may therefore be that I have been in error in placing this species under *quadratus* but I have examined a number of females, possibly teneral, distinctly referable to *quadratus* but so very pale that I was inclined to the view that Bigot must have had one of these before him when he described *flavidus* and not having possibly a sufficient series of specimens to show its true identity he felt it to be a distinct species. I believe the species *flavidus* has only once or twice been recognized as such since it was described.—M. D. L.]

Chrysopilus tomentosus. All three specimens are males. There are two species: one with long dark hairs on antennae, which must be considered the type; the other without the hairs and more like *anthracinus* but with long abdominal hairs whitish-yellow.

Mr. Chas. W. Johnson has pointed out to me that I used *Xylomyia* Rondani 1861 instead of *Solva* Walker 1860 and gave the genotype of *Solva* which is *inamoena* Walker. I was undoubtedly in error in this matter and had intended to use the generic name *Solva*, since it is really the correct name for the genus. Mr. Johnson also points out incidentally that the correct spelling is *Xylomya*.

Mr. Johnson writes that he had no part in the preparation of the list of Diptera in the first edition of Smith's New Jersey List, with the authorship of which I credited him in my bibliography.

Mr. F. W. Edwards of the British Museum writes me that he believes *Xylomyia* should probably have been placed in the Stratiomyidae as has been previously done by several authors, a course he suggests which seems justified by its life-history and morphology; also that he has little doubt that *Hilarimorpha* should go, along with *Mythicomyia*, in the subfamily Cyrtosiinae of the Bombyliidae. This may be true but I have not felt myself sufficiently well acquainted with the delimiting characters of several families nearly related to the Rhagionidae (sensu latu) to attempt to say very definitely to which families several genera, including those just mentioned, should really belong. It is hoped that several of these at present little-known genera can later be placed more accurately in their proper families.

Dr. W. M. Wheeler, in his "Demons of the Dust," pages 175, 176, (1930), has suggested that his *Vermileo comstocki* may possibly be the same as *V. opacus* Coquillett. This may be true but I still believe that, for the present, the two species should be kept distinct.

STUDIES IN THE MELYRIDAE (COLEOPTERA)

NUMBER TEN[1]

BY FRANK E. BLAISDELL, SR.

Stanford Medical School and California Academy of Sciences, San Francisco, California

(Plate XXIX)

The true *Trichochrous* Motschulsky, as recognized by LeConte and Casey, are characterized by having the lateral pronotal fimbriae, generally short, even, close-set and pale, rarely dark in color. The pubescence is more or less closely recumbent, without intermixed erect pale or black hairs or setae; occasionally, especially toward the sides of the elytra, some of the hairs may lie less closely on the surface and seem to be subserial in arrangement, as in *antennatus* Motsch.

Continued collecting in the desert regions of California is bringing new species to our collections. A very recent addition to the genus is at the present time described as follows:

Trichochrous blackwelderi new species

Form oblong-oval, robust, moderately strongly convex, slightly more than twice as long as wide, head relatively small. Color black; joints two to four inclusive of antennae more or less rufous, legs dark rufous, tips of femora and tarsi dark piceous. Elytra vittate. Pubescence dense, somewhat less so on the pronotum, rather coarse, closely recumbent and cinereous in color; a vitta of black hairs on each elytron, beginning a little behind the basal margin, extending more or less to apical third and gradually attenuated apically; a rather broad, oblong median black vitta on pronotum extending from apical margin to near base; pronotum without erect hairs, those of the elytra slightly reclined, sparse, pale in color except in the vittae where they are black, a few black hairs in the humeral area. Pronotal lateral and apical fimbriae pale in color, even, moderately short, recurved

[1] No. 1 (not so numbered on the paper). Can. Ent., LIII, pp. 15–19, Jan., 1921. No. 2. Trans. Amer. Ent. Soc., XLIX, pp. 315–337, Feb., 1924. No. 3. Pan-Pacific Ent., I, pp. 15–21, July, 1924. No. 4. Trans. Amer. Ent. Soc., L, pp. 313–316, Jan. 12, 1925. No. 5. Can. Ent., LVIII, pp. 8–13, Jan., 1926. No. 6. Pan-Pacific Ent., IV, pp. 49–53, Oct., 1927. No. 7. Pan-Pacific Ent., V, pp. 35–42, July, 1928. No. 8. Pan-Pacific Ent., VII, pp. 17–19, 1930. No. 9. Can. Ent., LXIII, pp. 178–183, Aug., 1931.

and close-set, that of the basal margin shorter and less conspicuous. Lateral fimbriae of the elytra moderately long, more widely spaced, becoming gradually shorter toward apex. Under surface of body less densely clothed with finer hairs of moderate length that are closely recumbent; very sparse on the shining and polished prosternum.

Head about equal to half of the pronotal width, moderately convex on vertex, flattened between the eyes, finely and sparsely punctate, punctures separated by a distance equal to three or four times their diameter. Eyes large, evenly convex and moderately prominent. Muzzle short. Antennae moderately stout, about attaining the middle of the pronotum; outer seven joints quite evenly incrassate. Joints five to eight inclusive somewhat serrate anteriorly.

Pronotum strongly convex, a fourth to a third wider than long; apical margin broadly arcuate in moderate circular arc, continuously so with the broadly rounded apical angles, sides continuing the arcuation very feebly and parallel, very slightly to more strongly sinuate before the obtuse and more or less distinct basal angles; base strongly arcuate, becoming broadly and feebly sinuate in lateral thirds. Marginal beads rather coarse, slightly reflexed, the lateral finely crenulate; disk evenly convex, smooth and shining throughout, finely and sparsely punctate as on the frons.

Elytra oblong, about a half longer than wide, less than twice as long as the pronotum, slightly widest behind the middle; sides parallel, feebly arcuate in basal two-thirds and broadly rounded at apex; disk evenly convex, sutural angles of apex narrowly and individually rounded, punctures more or less obscured by the pubescence, a little denser and stronger than on the pronotum; lateral margins narrowly explanate and slightly reflexed. Humeri rather large, rounded and moderately prominent.

Abdomen rather densely punctate, punctures somewhat small; segments two to four inclusive subequal in length, fifth a little longer.

Legs rather short and somewhat stout. Lower margin of the epipleurae horizontal and distinct to very near the apex.

Male.—Similar in form to the female, usually smaller, elytra not widening posteriorly, antennae slightly stouter. Abdominal segments shorter and more densely punctate; fifth broadly truncate at apex.

Female.—Usually stouter, elytra slightly widened posteriorly. Fifth segment of abdomen longer and arcuately rounded at apex.

Measurements.—(Types) Length, 3.8 to 4.2 mm.; width, 1.6 to 1.9 mm.

Holotype, female, No. 2950, and *allotype*, male, No. 2951, in the writer's collection at the Museum of the California Academy of Sciences, San Francisco, California. Collected by Richard E. Blackwelder, April 17, 1931, at Mohave, Kern County, California. Nine paratypes in the collections of Mr. Blackwelder and the author, one in the collection of The Academy of Natural Sciences of Philadelphia, taken at the same time and place as the types.

Blackwelderi is a very distinct and handsome species belonging to Casey's second group and is to be placed at the beginning of the group before *prominens* Casey. It differs from *vittiger* Casey by being much more robust and in having short erect hairs on the elytra, and from all other members of the second group by the vittate elytra. The vittae may be more or less obliterated. In the genus *Trichochrous* there is a rather wide range of variation in the outline of the pronotum in the individuals of a species, which renders the identification difficult unless the degree of variation is known. I refer mainly to the shape of the angles and degree of arcuation of the lateral margins and the degree of sinuation before the basal angles.

The discovery of a new species of *Eschatocrepis* Lec. in the desert regions of California renders a review of the genus necessary in order to correlate the species that have more recently been described:

ESCHATOCREPIS LeConte

1861. *Eschatocrepis* LeConte, Class. Coleop. N. Amer., p. 193.
1866. *Eschatocrepis* LeConte, Proc. Acad. Nat. Sci. Phila., XVIII, p. 349 and 361, Dec.
1883. *Eschatocrepis* LeConte and Horn, Class. Coleop. N. Amer., p. 215.
1895. *Eschatocrepis* Casey, Ann. N. Y. Acad. Sci., VIII, p. 587, Aug. (Coleop. Not., VI.)

Ungual appendages well developed, more or less equal, as long as the claws, attached basally but detached apically beyond the basal lobe of each claw (Pl. XXIX, fig. 17). Pronotal lateral margins more or less deeply sinuate behind the apical angles, discal submarginal surface adjacent thereto usually strongly impressed, the impression extending more or less distinctly across the disk, a submarginal line is present and varying

in distinctness in the species. Eyes large and basal. Antennae rather short, outer three joints somewhat incrassate and forming an evident three-jointed club; joints five and seven slightly serrate anteriorly and larger than the adjacent joints (Pl. XXIX, figs. 5 to 10). Protibiae cylindrical and devoid of all traces of spinules along the external surfaces. Epipleurae narrow and horizontal with the surface plane gradually turned upward and inward posteriorly. Fifth ventral abdominal segment more or less modified apically in both sexes, the apex transversely and rectangularly emarginate, angles with small pubescent tufts, with adjacent surface somewhat slightly declivous; sexual differences slight, varying in distinctness according to the angle of illumination.

Males.—Form more parallel. Elytra at times slightly dilated posteriorly; head larger, antennae relatively a little shorter and stouter, slightly compressed.

Females.—Form usually more dilated posteriorly; head smaller, antennae relatively longer and more slender.

GENOTYPE: *Eschatocrepis constrictus* (LeConte).[2]

Casey recognized variations indicating allied forms. A study of large series collected in limited areas shows that the pronotal subapical constriction varies quite markedly, due in part to the fact that the constriction and subapical impression are actually less in some specimens, while in others the former is strong but with the marginal surface more strongly deflexed and the sinuation hardly visible when viewed vertically from above. The pubescence is short and closely appressed to the surface without longer intermixed hairs; in part of the species the hairs are fuscous and inconspicuous, or paler and imparting a more or less cinereous tinge to the surface, the latter at times feebly aeneous.

At present three species can be recognized.[3] In each the intraspecific variations have a moderately wide range with all

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[2] 1852. *Dasytes constrictus* LeConte, Proc. Acad. Nat. Sci. Phila., VI, p. 170.
1859. *Listrus contricticollis* Motschulsky, Bull. Mosc., II, p. 390.
1866. *Eschatocrepis constrictus* LeConte, Proc. Acad. Nat. Sci. Phila., XVIII, p. 361. (Rev. Dasytini of U. S.)
1895. *Eschatocrepis constrictus* Casey, Ann. N. Y. Acad. Sci., VIII, p. 587. (Coleop. Not., VI.)

[3] *E. constrictus* LeConte, *E. nigripes* Blaisdell, (Can. Ent., LIII, p. 15, 1921), and *E. desertus* new species herein described.

necessary annectant characters. The species inhabit the region west of the Sierra Nevada Mountains from northern California, southward into Lower California.

The aedeagi of the males are ligulate and not tubular as in *Listrus* and *Trichochrous*.

The following new species is an addition to our list:

Eschatocrepis desertus new species (Pl. XXIX, figs. 3, 4, 9, 10, 15, 16)

Form obovate, noticeably narrowed anteriorly (female), to parallel (male), moderately depressed and somewhat elongate, about twice as long as wide (female) to about two and three-fourths times as long as wide (male). Color black; antennae and legs testaceo-rufous, eleventh joint of the former black, mouth-parts piceous. Luster shining, with a very feeble aeneous tinge. Pubescence sparse, short, quite recumbent, inconspicuous and fuscous in color throughout, slightly longer and finer on the pronotum; lateral pronotal fimbriae very short and recurved, those of the elytra longer and more widely spaced. Surface of the body extremely, finely and distinctly reticulo-granulate.

Head widest across the eyes, about a fourth narrower than the pronotal apex, moderately convex on the vertex; frons plane, slightly longitudinally impressed within the antennal convexities, a slight punctiform impression at middle on a line with the posterior border of the eyes, very finely and sparsely punctate, punctures separated by a distance equal to two to four times their diameter; muzzle very short; epistoma impunctate, transversely convex in feeble circular arc, apex truncate; labrum transversely oblong with apex feebly sinuate. Eyes large, evenly and moderately convex, well rounded in outline, much more prominent than sides of frons and tempora. Antennae similar in the sexes (Pl. XXIX, figs. 9–10), rather short, about attaining the posterior third of the pronotum, feebly incrassate in outer three joints, first and second subequal in size, third to eighth inclusive smaller, third slightly elongate and obconical, fifth noticeably larger, sixth and eighth smallest; fourth, seventh and eighth as long as wide, eleventh pointed obovate.

Pronotum about a fourth (female, Pl. XXIX, fig. 4) or one-tenth (male, Pl. XXIX, fig. 3) wider than long; apex broadly arcuate in feeble circular arc, very feebly sinuate in middle third; sides more or less strongly sinuate behind the apical angles rendering them obtusely prominent, thence more or less moderately arcuate to the obtuse basal angles which are scarcely evident; base more or less equal to the apex, broadly and moder-

ately strongly arcuate, scarcely sinuate in lateral fourths; disk moderately convex, strongly impressed at the post-apical sinuations, thence more or less feebly so across the disk, slightly impressed within the basal angles and faintly so at middle and lateral thirds before the base, a median slightly impressed line may be more or less evident; punctation sparse and more or less obscured by the reticulo-granulation of the surface, punctures small, separated by a distance equal to three or four times their diameter. Submarginal lines more or less feebly developed, usually obscured in apical third, submarginal area asperate.

Elytra about a half longer than wide, widest at posterior third, thence gradually convergent to base (female), to a little less than twice as long as wide (male). Base very slightly wider than that of the pronotum; humeri rounded and feebly tumid; sides feebly arcuate in basal two-thirds, thence more strongly so and broadly ogival at apex; disk rather broadly and feebly convex on dorsum, more strongly so and gradually declivous laterally and apically, margin very narrowly explanate and feebly reflexed laterally toward base, punctures less sparse than on the pronotum, slightly stronger, somewhat coarser and feebly impressed.

Under surface of body very sparsely and finely punctate, punctures denser apically on each abdominal segment, especially on the fourth.

Legs moderate in length and stoutness.

Male.—Parallel, elytra scarcely to slightly widened posteriorly, appearing more elongate; pronotum less strongly sinuate behind the apical angles, sides of the disk being more strongly deflexed, the angles being less prominent and more rounded. Fifth ventral abdominal segment truncate at apex with small pubescent tufts at the angles (Pl. XXIX, fig. 15). Legs appear somewhat more elongate.

Female.—Elytra more dilated posteriorly, post-apical sinuations of pronotum much stronger rendering the apical angles prominent. Fifth ventral segment more elongate and subtruncato-arcuate at apex (Pl. XXIX, fig. 16).

Measurements.—(Types) Male. Length, 2.1 mm.; width, .8 mm. Female. Length, 3 mm.; width, 1.2 mm.

Holotype, female, No. 2952, and *allotype*, male, No. 2953, in the author's collection at the Museum of the California Academy of Sciences, San Francisco, California. Collected by Richard E. Blackwelder, April 17, 1931, at Atolia, Mohave Desert, Kern County, California. Paratypes (six specimens) in Mr. Blackwelder's, the writer's, and The Academy of Natural Science of Philadelphia collections, taken at the same time and place as the types.

The differential characters of the species can best be given in a synoptic statement as follows:

Form elongate, parallel or the elytra more or less dilated posteriorly in the female, least so in the male; fifth ventral abdominal segment transversely and rectangularly emarginate at apex, adjacent surface very slightly impressed or declivous, the impression limited laterally at the angles by feeble asperate ridges which are densely pubescent.

Pubescence cinereous, imparting a grayish color to the body surface, surface sometimes aeneous; antennae, mouth-parts and legs testaceo-ferruginous; antennae stouter and slightly compressed in the male, third joint suboblong, obconical in the female, eleventh more or less piceous; pronotal apical angles rounded and somewhat moderately prominent (See pl. XXIX, figs. 1, 2, 5, 6, 11, 12 and 17) *constrictus* LeConte.

Pubescence pale fuscous, inconspicuous; antennae, mouth-parts and legs more or less dark piceous; upper surface more or less feebly subasperately reticulo-granulate, sometimes obscuring the punctation; antennae similar in the sexes, third joint obconical. Pronotal apical angles as in *constrictus* Lec. (See pl. XXIX, figs. 7, 8, 13 and 14). *nigripes* Blaisdell.

Form less elongate, more robust and obovate in the female; parallel, elytra scarcely dilated posteriorly in the male; pubescence fuscous and inconspicuous; antennae and legs pale and slender in both sexes, the former sometimes suffused with piceous and eleventh joint dark, third joint obconical and rather slender; pronotal apical angles prominent in the female, rounded and scarcely prominent in the male. Fifth ventral segment of male broadly truncate at apex; scarcely emarginate or truncato-arcuate at apex; adjacent surface not impressed or very feebly so in the female (See pl. XXIX, figs. 3, 4, 9, 10, 15 and 16).....*desertus* new species.

Explanation of Plate XXIX

Fig. 1.—Camera lucida outlines of the pronotum of *Eschatocrepis constrictus* Lec., head deflexed, male.

Fig. 2.—Same of female.

Fig. 3.—Pronotum of *Eschatocrepis desertus*, new species, head deflexed, male.

Fig. 4.—Same of female.

Fig. 5.—Left antenna of *Eschatocrepis constrictus* Lec., male.

Fig. 6.—Right antenna of female of same species.

Fig. 7.—Right antenna of *Eschatocrepis nigripes* Blais., male.

Fig. 8.—Left antenna of female of same species.

Fig. 9.—Right antenna of *Eschatocrepis desertus*, new species, male.

Fig. 10.—Same of female.

Fig. 11.—Fifth ventral abdominal segment of *Eschatocrepis constrictus* Lec., showing modification of apex, male.

Fig. 12.—Same of female.

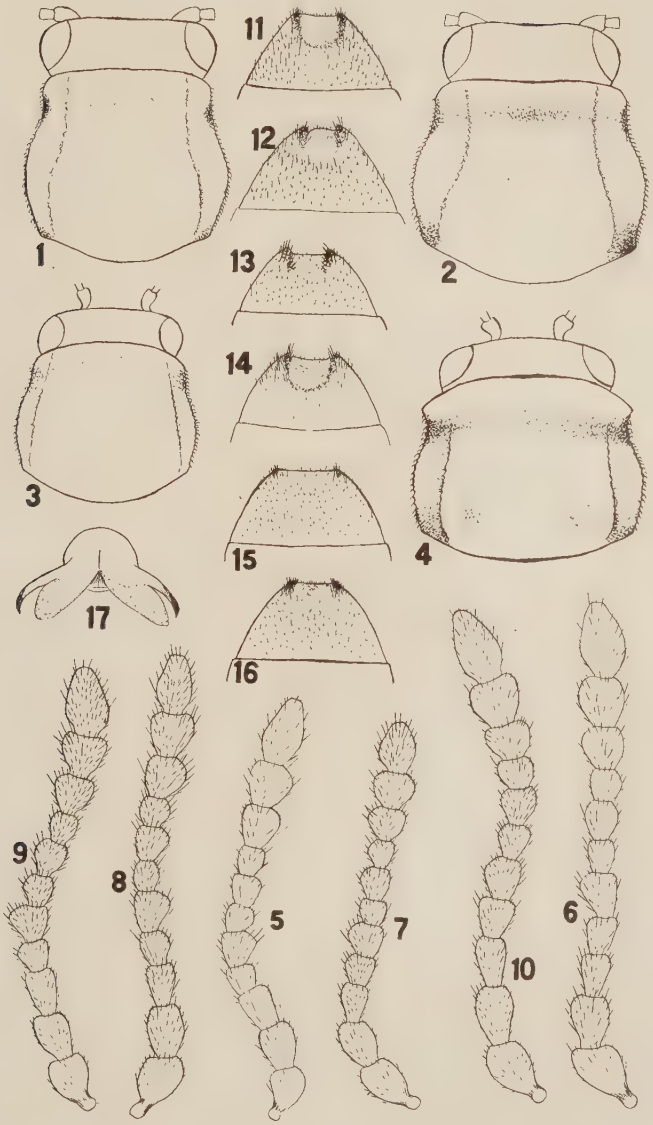
Fig. 13.—Fifth ventral segment of *Eschatocrepis nigripes* Blais., female.

Fig. 14.—Same of male.

Fig. 15.—Fifth ventral of segment of *Eschatocrepis desertus*, new species, male.

Fig. 16.—Same of female.

Fig. 17.—Claws and appendages of *Eschatocrepis constrictus* Lec.



BLAISDELL—MELYRIDAE

INDEX

New names are followed by the name of the author within parentheses ( ). An asterisk (*) denotes that a figure is referred to on that page. Names and page numbers in italics refer to synonyms.

An index to the species of the Odonate genus *Palaemnema* will be found on page 111.

---

abdominalis, Ornebius..... 158
Abrodiaeta 298
(*see also* modesta)
Achlyodes (*see* busirus, mithrax, negro, noctula)
Acrididae 116
Adopaea (*see* magdalia)
aecas, Flacilla..... 284
Aethilla (*see* jariba)
Agrionidae 1
Aguna (*see* ganna)
alardus, Telegonus..... 255
albibarbis, Leptis..... 322
albimargo, Eudamus..... 251
alienus, Hymenorus (Fall).... 217
Allacta 300
Allecula (*see* pilosus, punctulatus)
Alleculidae 161
almoda, Phanes.....275*
Amblyscirtes (*see* insulae-pinorum)
amphion, Telemiades.....255*
amyclas, Pyrrhopyge..... 251
Anastrus (*see* petius)
ancus, Pamphila..... *313*
Ancyloxypha (*see* nanus)
Andrenosoma 129
(*see also* batesi, currani, flamipennis, heros, lupus, minos, nigrum, proxima, rufipennis, rufum, subheros, varipes)
anthracinus, Chrysopilus..... 322
antillarum, Cycloptilum, *Ectatoderus* 139
antiqua, Pyrrhocalles.....315*
apacheanus, Hymenorus..... 202
Apaustus (*see* menes)
arcas, Ephyriades, *Papilio*.....309*
ares, Prenes..... *316*
arkansanus, Hymenorus (Fall). 183
arsalte, Heliopetes..... 269
Arthroceras (*see* pollinosum)
Artines (*see* atizies)
artona, Carystus..... 284
Asbolis (*see* capucinus, sandarac)
Asilidae 129
assimilis, Gryllus..... 127
asychis, Chiomara..... 268
Atalopedes (*see* mesogramma)
athenion, Polites..... 269
atratus, Hymenorus (Fall).... 189
atizies, Artines..... 285
Atrytone (*see* barbara, mella, tristis, vitellius)
aunus, Cecropterus..... 256
avitus, Telemiades..... 255

baracoa, Polites, *Limochares*... 313
barbara, Atrytone (Williams and Bell).....271*
barberi, Grylloblatta.....293
barcastus, Mysoria..... 251
basoches, Carystoides..... 285
batabano, Phocides..... 307
batesi, Andrenosoma (Bromley) 132

begga, Gorgythion.....267*
bicolor, Mnaseas..... 279
bidens, Cycloptilum (Hebard)..147*
bitumescens, Hymenorus (Fall) 194
blackwelderi, Trichochrous (Blaisdell) 325
Blatta (*see* ceylanica)
Blattidae 297
blossomiae, Yanguna (Williams)288*
bocus, Cecropterus..... 256
boreale, Hoplosphyrum, *Ectatoderus* 158
braco, Staphylus, *Nisoniades*...311*
brevis, Hymenorus (Fall)..... 230
bromias, Pellicia..... 264
brunnea, Melanthes..... *309*
Bungalotis (*see* midas)
busirus, Achlyodes..... 265

Cabares (*see* potrillo)
caducus, Hymenorus (Fall).... 213
caeso, Niconiades..... 274
Calamacris (*see* mexicana, oculata)
calchas, Cogia..... 256
californicus, Heliastus..... 121
Callimormus (*see* corades, gracilis, radiola)
Calpodes (*see* coscinia)
campodeiformis, Grylloblatta...291*
cannae, Cobalus..... 274
capensis, Hymenorus (Fall).... 205
capucinus, Asbolis.....316*
capys, Cecropterus..... 256
Carystoides (*see* basoches, replana)
Carystus (*see* artona, fantasos, marcus, micylla, subrufescens)
cassus, Hymenorus (Fall)..... 197
Catia (*see* misera, ophites, otho, vesuria)
catillus, Chioides..... 253
catocala, Megistias..... 282
caurinus, Hymenorus (Fall).... 185
celeus, Vehilius..... 280
Cecropterus (*see* aunus, bocus, capys, neis)
Celaenorrhinus (*see* eligius)
ceramina, Telemiades.....255*
cerialis, Quadrus..... 263
ceylanica, Margattea, *Blatta*...303*
Charidia (*see* lucaria)
Chimarocephala (*see* incisa, pacifica)
Chioides (*see* catillus)
chiomara, Thracides..... 285
Chiomara (*see* asychis, gesta, mithrax, punctum)
Choranthus (*see* radians)
Chrysopilus (*see* anthracinus, flavidus, quadratus, testaceipes, tomentosus)
cinereus, Horesidotes..... 116
cingulicormis, Eutychide..... 275
Cistela (*see* niger, obscurus)
clonius, Spathilepia..... 257
Cobalus (*see* cannae, dispersa, percosius, virbius, zeppa)
coeleste, Grynopsis.....259*
Coeliades (*see* fiscella)
Cogia (*see* calchas, freudiae)
communis, Hymenorus..... 194
complana, Eutychide..... 275
comprehendens, Cycloptilum....157*
compta, Euroto..... 276
comstocki, Vermileo..... 323
concolor, Staphylus.....317*
confertus, Hymenorus..... 223
conformis, Hymenorus (Fall).. 199
conicicollis, Hymenorus (Fall). 239
Conozoa (*see* sulcifrons)
constrictus, Eschatocrepis, *Dasytes, Listrus*.....331*
conta, Hesperia..... *313*
contectum, Cycloptilum..... 138
convexus, Hymenorus..... 226
corades, Callimormus..... 285
coridon, Perihares.....286, 317
cornelius, Tigasia.....315*
corrupta, Prenes.....316*
coscinia, Calpodes..... *316*

coxeyi, Eudamus (Williams) ... 288*
coxeyi, Sphinx ... 319*
creteus, Telegonus ... 253
crinisus, Lignyostola ... 257*
crinitus, Hymenorus (Fall) ... 244
crisia, Pyrgus, *Hesperia* ... 312*
cubana, Paracarystus ... 318*
cubana, Telegonus ... 308
cubensis, Ephyriades ... 318*
currani, Andrenosoma (Bromley) ... 133
curticollis, Hymenorus ... 193
Cyclogypha (*see* gundlachi)
Cycloptilum ... 137
(*see also* antillarum, bidens, comprehendens, contectum, distinctum, fortior, interior, squamosum, trigonipalpum, zebra)
Cymaenes (*see* malitiosa)

Dasytes (*see* constrictus)
densus, Hymenorus ... 225
deplanatus, Hymenorus ... 231
desertus, Eschatocrepis (Blaisdell) ... 329*
Dialysis (*see* dispar)
dichrous, Hymenorus ... 224
dictynna, Polites ... 269*
difficilis, Hymenorus ... 189
digressus, Hymenorus (Fall) ... 206
discrepans, Hymenorus ... 210
discretus, Hymenorus ... 213
dispar, Dialysis ... 321
disparatus, Hymenorus (Fall) ... 215
dispersa, Gomiloba, Cobalus ... *313*
dissensus, Hymenorus ... 235
distinctus, Hymenorus (Fall) ... 179
distinctum, Cycloptilum (Hebard) ... 150*
dorantes, Eudamus ... 252
dorsalis, Hymenorus ... 212
doryssus, Eudamus ... 252
Dracotettix (*see* newboldi)
dubius, Hymenorus (Fall) ... 184

Eantis (*see* papinianus, thraso)
ebeninus, Hymenorus (Fall) ... 188
Ectatoderus ... 137
(*see also* antillarum, borealе, kilimanjaricus)
elbertae, Hymenorus ... *227*
eligius, Celaenorrhinus ... 263
Entheus (*see* gentius, mina, priassus)
Epargyreus (*see* exadeus, maysi)
ephora, Pellicia ... 264
Ephyriades (*see* arcas, cubensis, zephodes)
epictetus, Padraona ... 273
Erynnis (*see* gesta, zarucco)
Eschatocrepis ... 327
(*see also* constrictus, desertus, nigripes)
Eudamidas (*see* jason)
Eudamus (*see* albimargo, coxeyi, dorantes, doryssus, parvus, proteus, santiago)
eufala, Lerodea, *Hesperia* .. 273, 313
eugeon, Prenes ... 274*
Euroto (*see* compta, micythus, potaro, saramacca)
eurycles, Goniurus ... 252
Eutychide (*see* cingulicormis, complana)
evanescens, Paramimus ... 267*
exadeus, Epargyreus ... 253
exiguus, Hymenorus ... 210
exilis, Hymenorus (Fall) ... 233

facetus, Hymenorus (Fall) ... 234
fantasos, Carystus ... 284
fartuga, Phlebodes ... 277*
fiscella, Coeliades ... 284
Flacilla (*see* aecas)
flamipennis, Andrenosoma (Bromley) ... 133
flavidus, Chrysopilus ... 322
floridae, Pamphila ... *313*
floridanus, Hymenorus ... 240
forbesi, Vehilius (Williams and Bell) ... 280*
fortior, Cycloptilum (Hebard) .. 153*
freudiae, Cogia (Williams and Bell) ... 256*

fridericus, Ouleus..... 264
fulgerator, Telegonus..... 253
fuliginosa, Thargella..... 279
fuscipennis, Hymenorus (Fall). 211
fusculus, Hymenorus..... 238
fusicornis, Hymenorus..... 228
fusina, Prenes..... 273

ganna, Aguna..... 253
gemellus, Hymenorus..... *231*
gentius, Entheus.....260*
gesta, Erynnis, *Chiomara, Thanaos* 269, *312*
gibbosus, Lactista..... 119
godmani, Phanus (Williams and Bell) 286*
godmani, Tigasis..... *315*
Godmania (*see* malitiosa, silius)
Gomilobia (*see* dispersa)
Gonilobia (*see* hemeterius)
Goniurus (*see* eurycles, simplicius)
gordius, Sphinx.....319*
Gorgythion (*see* begga, pyralina)
gracilis, Callimormus..... 285
grandicollis, Hymenorus..... 197
granulatus, Hymenorus..... 224
Gryllidae 127, 135
Grylloblatta (*see* barberi, campodeiformis, occidentalis)
Grylloblattidae 291
Gryllus (*see* assimilis)
Grynopsis (*see* coeleste)
gunderi, Phocides (Williams and Bell)..... 251
gundlachi, Cyclogypha..... *318*

habana, Telegonus..... 308
Haliastus (*see* parviceps)
Helias (*see* phalaenoides)
Heliastus (*see* californicus)
Heliopetes (*see* arsalte, petrus)
helvinus, Hymenorus..... 198
hemeterius, Goniloba, Tigasis.. *315*
hermesia, Thracides.....285*
heros, Andrenosoma (Bromley). 131
Hesperia (*see* conta, crista, eufala, papinianus)
Hesperiidae 249, 305
heteropygus, Hymenorus (Fall) 241
Hilarimorpha 323
(*see also* obscura)
hoodianus, Leptis..... 322
Hoplosphyrum 158
(*see also* boreale)
Horesidotes (*see* cinereus, saltator)
horrescens, Hymenorus (Fall).. 235
huascari, Megistias..... 282
humeralis, Hymenorus..... 177
Hyalothyrus (*see* nitocris)
Hylephila (*see* phylaeus)
Hymenorus 161
(*see also* alienus, apacheanus, atratus, arkansanus, bitumescens, brevis, caducus, capensis, cassus, caurinus, communis, confertus, conformis, conicicollis, convexus, crinitus, curticollis, densus, deplanatus, dichrous, difficilis, digressus, discrepans, discretus, disparatus, dissensus, distinctus, dorsalis, dubius, ebenunus, elbertae, exiguus, exilis, facetus, floridanus, fuscipennis, fusculus, fusicornis, gemellus, grandicollis, granulatus, helvinus, heteropygus, horrescens, humeralis, idoneus, illusus, inaequalis, incertus, indutus, infuscatus, inopiatus, inquilinus, intermedius, inutilis, irritus, jacobinus, liebecki, macer, macilentus, melsheimeri, milleporus, molestus, montivagus, nevadensis, niger, nitidipennis,

obesus, oblivius, obscurus, occidentalis, papagonis, parvus, perforatus, picipennis, pilosus, planulus, porosicornis, prolixus, protibialis, punctatissimus, punctulatus, quietus, rotundicollis, ruficollis, rufovalis, sabalensis, semirufus, seriatus, significans, simiolus, sinuatus, sobrinus, spinifer, tenellus, tenuistriatus, testaceus, texensis, thoracicus, tritus, trivialis, ulomoides, uniseriatus, vigilax)

idoneus, Hymenorus (Fall).... 218
illusus, Hymenorus (Fall)..... 192
inaequalis, Hymenorus..... 218
incertus, Hymenorus (Fall).... 220
incisa, Chimarocephala..... 119
indutus, Hymenorus..... 221
infuscatus, Hymenorus..... 186
inopiatus, Hymenorus (Fall)... 242
inquilinus, Hymenorus..... 229
insulae-pinorum, Amblyscirtes.. *315*
insularis, Litoscirtus..... 124
interior, Cycloptilum (Hebard).151*
intermedius, Hymenorus..... 221
inutilis, Hymenorus (Fall)..... 208
irritus, Hymenorus (Fall)..... 199
isabellina, Nisoniades.....*311*

jacobinus, Hymenorus (Fall).. 206
jamaca, Megistias..... *313*
jariba, Telegonus, *Aethilla*.... 309
jason, Eudamidas..... 264
jovianus, Pythonides.....263*

kilimanjaricus, Ectatoderus.... 137
koebelei, Tanaocerus..... 122

labdacus, Megistias..... 282
Lactista (*see* gibbosus)
Laphria (*see* olbus)
latimargo, Telegonus..... 255
laurea, Vettius.....284*
Leptipalpus (*see* limbipennis, obscuripennis)
Leptis (*see* albibarbis, hoodianus, maculifera, pruinosus)
lerina, Pythonides.....263*
Lerodea (*see* eufala, obscura, tripunctus)
leucodesma, Paramimus..... 268
liebecki, Hymenorus (Fall).... 245
Lignyostola (*see* crinisus)
limbipennis, Leptipalpus..... 322
Limochares (*see* baracoa)
Liphoplus (*see* zebra)
Listrus (*see* constrictus)
litana, Vacerra..... 274
Litoscirtus (*see* insularis)
lividus, Polygonus..... 308
lotus, Perichares..... 286
lucaria, Charidia.....268*
lugubris, Quadrus..... 263
lupus, Andrenosoma (Bromley). 130

macarius, Pellicia..... 264
macer, Hymenorus..... *221*
macilentus, Hymenorus (Fall). 188
maculifera, Leptis..... 322
magdalia, Adopaea, *Thymelicus*.313*
malitiosa, Godmania, *Cymaenes*.317*
Mantidae 114
marcus, Carystus..... 284
Margattea 302
(*see also* ceylanica)
marshalli, Phanus.....260*
maysi, Epargyreus..... 308
Megistias (*see* catocala, huascari, jamaca, labdacus, noctis, telata, theogenis, tripunctus)
Melanthes (*see* brunnea)
mella, Atrytone..... 270
melsheimeri, Hymenorus..... 181
Melyridae 325
menes, Apaustus..... 269
mesogramma, Atalopedes.....313*
mexicana, Calamacris..... 123
mexicana, Yersinia..... 114

micylla, Carystus *313*
micythus, Euroto 276
midas, Bungalotis 256
milleporus, Hymenorus (Fall) .. 236
mina, Entheus (Williams and Bell) 260*
minos, Andrenosoma (Bromley) 130
misera, Catia 315*
mithrax, Chiomara, *Achlyodes* .. 317
Mnaseas (*see* bicolor)
Mnasilus (*see* penicillatus)
Mnasitheus (*see* simplicissima)
modesta, Abrodiaeta 298
molestus, Hymenorus (Fall) ... 182
montivagus, Hymenorus (Fall) . 207
mys, Zariaspes 273
Mysoria (*see* barcastus)

naevius, Thanaos *311*
nanus, Ancyloxypha 318*
negro, Achlyodes 265*
neis, Cecropterus 256
nevadensis, Hymenorus (Fall) . 236
newboldi, Dracotettix (Hebard) 125*
newboldi, Yersiniops (Hebard) .115*
Niconiades (*see* caeso, xanthaspes)
niger, Hymenorus, *Cistela, Mycetochares* 178
nigripes, Eschatocrepis 331*
nigrum, Andrenosoma (Bromley) 132
Nisoniades (*see* braco, isabellina, undulatus)
nitidipennis, Hymenorus 209
nitocris, Hyalothyrus 257*
noctis, Megistias 282
noctula, Achlyodes *317*
nyctelius, Prenes 273, 316

obesus, Hymenorus 183
oblivius, Hymenorus (Fall) 216
obscura, Hilarimorpha 322
obscura, Lerodea *313*
obscuripennis, Leptipalpus 322
obscurus, Hymenorus, *Cistela* ... 190
occidentalis, Grylloblatta (Silvestri) 293*
occidentalis, Hymenorus 204
oculata, Calamacris 123
olbus, Laphria 130
Oleides (*see* zephodes)
Oligacanthopus (*see* prograptus)
ophites, Catia 270*
orcus, Pyrgus 269
Ornebius (*see* abdominalis)
otho, Catia 270
Ouleus (*see* fridericus)

pacifica, Chimarocephala 119
Padraona (*see* epictetus)
Palaemnema 1
index to species 111
palemon, Phocides 251
pallidipennis, Trimerotropis 119
Pamphila (*see* ancus, floridae)
papagonis, Hymenorus (Fall) .. 201
papias, Tarsoctenus 251
Papias (*see* phaomelas)
Papilio (*see* arcas)
papinianus, Eantis, *Hesperia* ...311*
Paracarystus (*see* cubana)
Paramimus (*see* evanescens, leucodesma, scurra)
Parphorus (*see* storax)
parviceps, Haliastus 120
parvus, Eudamus 252
parvus, Hymenorus (Fall) 203
paterculus, Thanaos *309*
Pellicia (*see* bromias, ephora, macarius)
penicillatus, Mnasilus 280*
percosius, Cobalus 275
perforatus, Hymenorus 190
Perihares (*see* coridon)
Perichares (*see* lotus)
Perimeles (*see* remus)
pervivax, Telegonus 253
petius, Anastrus 264
petrus, Heliopetes 269
phaeomelas, Papias 279
phalaenoides, Helias 265

Phanes (*see* almoda, godmani, marshalli, rezia, vitreus)
phidias, Pyrrhopyge..... 251
Phlebodes (*see* fartuga, reticulata, tiberius)
Phocides (*see* batabano, gunderi, palemon)
phylaeus, Hylephila, *Polites*.269, 312
picipennis, Hymenorus 178
pilosus, Hymenorus, *Allecula* 180, *183*
planulus, Hymenorus..... 208
Polites (*see* athenion, baracoa, dictynna, vibex)
pollinosum, Arthroceras..... 322
Polygonus (*see* lividus)
porosicornis, Hymenorus..... 198
potaro, Euroto (Williams and Bell) 277*
potrillo, Cabares..... 309
Prenes (*see* ares, corrupta, eugeon, fusina, nyctelius, sylvicola, vala)
priassus, Entheus.....260*
prograptus, Oligacanthopus.... 136
prolixus, Hymenorus..... 205
Proteides (*see* san-antonio)
proteus, Eudamus.....252, 307
protibialis, Hymenorus (Fall). 196
proxima, Andrenosoma..... 134
pruinosus, Leptis..... 322
Psoloessa sp..... 118
punctatissimus, Hymenorus.... 221
punctulatus, Hymenorus, *Allecula* 186
punctum, Chiomara.....268*
pyralina, Gorgythion..... 267
Pyrgus (*see* crisia, orcus, syrichtus)
Pyrrhocalles (*see* antiqua)
Pyrrhopyge (*see* amyclas, phidias)
Pythonides (*see* jovianus, lerina)

quadratus, Chrysopilus..... 322
Quadrus (*see* cerialis, lugubris)
quietus, Hymenorus (Fall).... 239
radians, Choranthus.....315*
radiola, Callimormus..... 285
remus, Perimeles..... 275
replana, Carystoides..... 285
reticulata, Phlebodes.....279*
rezia, Phanes.....275*
Rhagionidae 321
rotundicollis, Hymenorus..... 228
ruficollis, Hymenorus..... 233
rufipennis, Andrenosoma..... 134
rufovalis, Hymenorus (Fall)... 230
rufum, Andrenosoma (Bromley) 132
rugosus, Tanaocerus (Hebard).122*

sabalensis, Hymenorus..... *212*
salius, Thracides..... 285
saltator, Horesidotes (Hebard).116*
san-antonio, Proteides..... 308
sandarac, Asbolis..... *316*
santiago, Eudamus..... 307
saramacca, Euroto (Williams and Bell).....276*
scheria, Vehilius..... 280
Schistocerca (*see* vaga)
scurra, Paramimus.....267, 268
semirufus, Hymenorus (Fall).. 203
sergestus, Talides..... 286
seriatus, Hymenorus..... 229
significans, Hymenorus (Fall).. 237
silius, Godmania..... 284
simiolus, Hymenorus (Fall).... 232
simplicissima, Mnasitheus..... 280
simplicius, Goniurus..... 253
sinuatus, Hymenorus (Fall).... 187
sobrinus, Hymenorus..... 243
solitaria, Yersinia..... 114
Solva 323
sophronica, Yersinia..... 114
Spathilepia (*see* clonius)
spinifer, Hymenorus..... 195
Sphingidae 319
Sphinx (*see* coxcyi, gordius)
squamosum, Cycloptilum.....144*
Staphylus (*see* braco, concolor)
staudingeri, Yanguna..... 290
storax, Parphorus..... 284

subheros, Andrenosoma (Bromley) 131
subrufescens, Carystus..... 284
sulcifrons, Conozoa..... 119
sylvicola, Prenes.....273, 315
syrichtus, Pyrgus.....269, 312

Talides (*see* sergestus)
talus, Telegonus..... 309
Tanaocerus (*see* koebelei, rugosus)
Tarsoctenus (*see* papias)
telata, Megistias..... 283
Telegonus (*see* alardus, creteus, cubana, fulgerator, habana, jariba, latimargo, pervivax, talus, xagua)
telegonus, Thracides..... 286
Telemiades (*see* amphion, avitus, ceramina)
tenellus, Hymenorus..... 227
tenuistriatus, Hymenorus (Fall) 226
terentius, Thanaos..... *311*
testaceipes, Chrysopilus..... 322
testaceus, Hymenorus..... 215
texensis, Hymenorus (Fall).... 241
Thanaos (*see* gesta, naevius, paterculus, terentius)
Thargella (*see* fuliginosa)
theogenis, Megistias..... 283
thoracicus, Hymenorus (Fall). 214
Thracides (*see* chiomara, hermesia, salius, telegonus)
thraso, Eantis..... 265
Thymèlicus (*see* magdalia)
tiberius, Phlebodes..... 277
Tigasia (*see* cornelius, godmani, hemeterius)
Timochares (*see* trifasciata)
tomentosus, Chrysopilus..... 322
triangularis, Vettius..... 284
Trichochrous (*see* blackwelderi)
trifasciata, Timochares..... 265
trigonipalpum, Cycloptilum.... 141
Trimerotropis (*see* pallidipennis)
tripunctus, Megistias, *Lerodea*.... 281, 282, 313
tritus, Hymenorus (Fall)..... 219
tristis, Atrytone..... 273
trivialis, Hymenorus (Fall).... 210
tryxus, Xenophanes..... 264

ulomoides, Hymenorus (Fall).. 187
undulatus, Nisoniades..... *311*
uniseriatus, Hymenorus..... 243

Vacerra (*see* litana)
vaga, Schistocerca..... 127
vala, Prenes..... 274
varipes, Andrenosoma..... 132
Vehilius (*see* celeus, forbesi, scheria, venosus)
venosus, Vehilius..... 280
Vermileo (*see* comstocki)
vesuria, Catia..... 270
Vettius (*see* laurea, triangularis)
vibex, Polites..... 270
vigilax, Hymenorus (Fall)..... 200
virbius, Cobalus.....274*
vitellius, Atrytone..... 273
vitreus, Phanus.....259*

xagua, Telegonus..... 308
xanthaspes, Niconiades..... 274
Xenophanes (*see* tryxus)
Xylomya 323

Yanguna (*see* blossomiae, staudingeri)
Yersinia(*see* mexicana, solitaria, sophronica)
Yersiniops (Hebard)..... 114
(*see also* newboldi)

Zariaspes (*see* mys)
zarucco, Erynnis..... 311
zebra, Cycloptilum, *Liphoplus*..143*
zephodes, Ephyriades, *Oleides*.. 309
zeppa, Cobalus..... 274

7 ... R 1931
AL USA. 36

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CONTENTS

The Generic Characters and the Species of Palaemnema (Odonata: Agrionidae). By Philip P. Calvert..... 1
(Issued March 11, 1931)

Studies in Lower Californian Orthoptera. By Morgan Hebard..... 113
(Issued March 11, 1931)

New Neotropical Andrenosoma (Diptera: Asilidae). By S. W. Bromley..... 129
(Issued March 11, 1931)

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VOLUME LVII NUMBER 2

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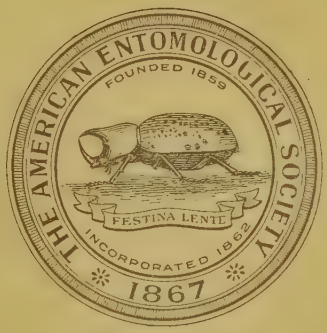

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CONTENTS

The Mogoplistinae of the United States (Orthoptera: Gryllidae). By Morgan Hebard 135
(Issued May 4, 1931)

The North American Species of Hymenorus (Coleoptera: Alleculidae). By H. C. Fall 161
(Issued June 8, 1931)

Hesperiidae of the Forbes Expedition to Dutch and British Guiana (Lepidoptera). By Roswell C. Williams, Jr. and Ernest L. Bell 249

Two New Hesperids from Ecuador. By Roswell C. Williams Jr. 288
(Issued June 10, 1931)

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CONTENTS

Notes on Grylloblatta campodeiformis and a Description of a New Variety (Grylloblattidae). By F. Silvestri 291
(Issued June 12, 1931)

On the Blattid Genera Abrodiaeta Brunner (=Allacta Saussure and Zehntner) and Margattea Shelford (Orthoptera). By James A. G. Rehn 297
(Issued July 17, 1931)

Cuban Hesperiidae (Lepidoptera). By R. C. Williams, Jr. 305
(Issued August 3, 1931)

A New Form of Sphinx gordius (Cramer) (Lepidoptera: Sphingidae). By John W. Cadbury 3d..... 310
(Issued September 11, 1931)

VOLUME LVII NUMBER 4

DECEMBER, 1931

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CONTENTS

Some Notes on My Revision of the Rhagionidae (Diptera). By Mortimer D. Leonard 321

(Issued December 9, 1931)

Studies in the Melyridae (Coleoptera). By Frank E. Blaisdell, Sr. 325

(Issued January 29, 1932)

Title Page, List of Papers, List of Members